REGIONAL INSTITUTE FOR POPULATION STUDIES

UNIVERSITY OF GHANA

HOUSEHOLD EXPERIENCE OF FLOOD AND ITS EFFECT ON ANXIETY: INVESTIGATING THE MEDIATING ROLE OF PLACE ATTACHMENTAND PERCEIVED SAFETY IN TOTOPE AND KETA

BY

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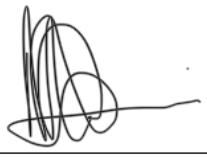
THIS DISSERATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILLMENT OF THE PREREQUISITES FOR THE AWARD OF THE MA POPULATION STUDIES DEGREE.

APRIL 2023

DECLARATION

I, MARTIN MAWUTOR KWABLAH AGBODZI, hereby declare that this is the outcome of my research and has not been submitted in whole or in part for another degree, except references to other people's work that have been properly acknowledged.



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ACCEPTANCE

This dissertation is accepted by the College of Humanities, University of Ghana, Legon, in fulfilment of the requirement for the award of an M.A. Population Studies degree.

27/04/2023

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DATE

DEDICATION

I dedicate this dissertation firstly to Elohim. Whose mercies and boundless grace saw me through this journey. I also dedicate this work to my wife who has been my motivation for this study, and my parents, siblings, and friends who have been very supportive throughout this study. May the good Lord continue to bless you all.

ACKNOWLEDGEMENT

First gratitude goes to my Father in Heaven for His abundant, grace, love, and mercy that kept me going and most importantly for the wisdom and knowledge He has blessed me with.

My sincerest gratitude to my supervisor Dr. Mumuni Abu, for his assistance and belief in me that I could do this even when it seemed like I was at a dead end. Thank you for encouraging me to enrol in the RIPS MA program. God bless you immensely.

To the RIPS faculty, a big thank you for your support and guidance throughout the program. Special gratitude to Charles Asabere, who encouraged me to take on this challenge and was always ready to assist me anytime I called on him. God bless you immensely.

To my beautiful and loving wife, Ing. Bernadette Dzifa Agbefu, for your prayers, motivation, and support. Your support from the very day I applied for the program is very much appreciated. To my father, Mr. Andrew Bernhardt Agbodzi, my mother Mrs. Mary Agbodzi, my brother Nathaneal Agbodzi and my sister Veronica Agbodzi, thank you for your prayers and support. To my mother-in-law, Miss Emelia Mensah, thank you for your prayers and support throughout this program. Sincerest gratitude also to Pastor Elorm Dartey who assured me it was a great time to pursue my master's and Mr Hiram Anane, a dependable friend. To my colleagues at Dataplas Limited, thank you for your support. Also, to Dr. Kwabina Ibrahim of the Department of Earth Science, thank you for always being there to offer advice and support.

Finally, to the entire 2021/2022 MA cohort. Thank you for your friendship. May God in his infinite mercy continue to bless us all.

ABSTRACT

Natural disasters, especially flooding, could and often do affect different populations, but a portion of those affected typically experience clinically significant stress and anxiety symptoms, which may necessitate the assistance of mental health professionals. The recent trend of global flooding, mostly driven by climate-related issues, will exacerbate the mental health issues associated with flooding. This study examined how place attachment and perceived safety mediate the relationship between flooding and anxiety. Using the Evaluating Health Impact of Climate Adaptation Strategies (EHICAS) Data, collected by the Regional Institute for Population Studies, University of Ghana in 2021, the study employed a quantitative approach to understand the relationship between experience of flood and anxiety disorders in selected flood-prone coastal communities in Ghana. The results showed that a quarter of the respondents did not experience any anxiety as a result of the flood experience, while three-quarters of the respondents suffered some anxiety. From the results, 47.5% of the respondents did not feel safe in their communities, while 31.5% felt safe. The remaining respondents were indifferent about their perception of safety in the community. The results further showed that 63% of the respondents were indifferent about their attachment to their communities, while 21% showed they were attached to their communities and 16% showed they had no attachments. The final model of the study showed that people who experience flood do not necessarily experience anxiety but their perception of safety was a more significant predictor of an individual's experience of anxiety. Some other significant predictors of anxiety are income and household tenure. The study recommends that measures be in place to meet the psychological needs of flood victims. Collaborating with mental health professionals, educating the populace on the psychological impacts of floods and involving the community in supporting flood victims are some of the measures that can be put in place.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

BACKGROUND

1.1 Introduction

Natural disasters such as earthquakes, floods, cyclones, storms, wildfires, volcanic eruptions, and landslides have shaped the earth's terrain for countless years. When these natural processes interact with man-made characteristics like infrastructure, agriculture, and settlements, they can result in natural disasters. (Chaudhary & Piracha, 2021). The problems associated with the impact of natural disasters on the affected population include loss of employment, damages to housing, and loss of lives, which usually affect the economic well-being of the population as well as their, mental and physical health. Natural disasters, especially flooding, affect populations differently, with some experiencing clinically significant stress and anxiety symptoms (Schwartz et al. 2015; Schwartz et al. 2018), which may necessitate the assistance of mental health professionals (Schwartz et al, 2018). The recent trend of flooding globally, which is mostly driven by climate-related issues, will exacerbate the mental health issues associated with flooding.

In 2020, The Lancet Global Health estimated that depression and anxiety are two of the most prevalent mental disorders that cost the global economy $1 trillion in lost productivity, and more than 75% of people with mental disorders in low- and middle-income countries do not receive any treatment at all (Suhuyini, 2022). However, research on the impact of floods on the population has mostly focused on the damages caused to infrastructure and businesses, with limited attention paid to the mental health of the affected population.

Flooding can challenge the psychosocial resilience of the hardiest of people who are affected (Stanke et al. 2012). Anxiety disorders represent a failure to either elect an adaptive response or to inhibit a maladaptive response given a situation (Thayer and Lane, 2000). Anxiety is a state of diffuse arousal following the perception of a real or imagined threat. This fundamentally

experiential, future-oriented, self-focusing emotion at times can be adaptive as anticipatory problem-solving thoughts are triggered. Anxiety disorders will directly implicate emotion (Amstadter, 2008; Thayer and Lane, 2000).

This study conducted in Ghana a developing country, focused on anxiety disorders among the residents of Totope and Keta, who have been exposed to floods for decades. The Volta Delta has the presence of agricultural and transportation opportunities provided by the water bodies, which provide water for irrigation, silt for improving soil, and simple transportation for shipping people and goods, which have long been exploited by societies in delta areas. On the other hand, flooding on these same water bodies puts lives and means of subsistence in danger. Deltas are additionally vulnerable to flooding from the sea because of high tides and/or storm surges, cyclones, etc. because of their coastal location. Households and communities in the Volta Delta employ both autonomous and planned adaptation strategies to respond to the multiple threats of climatic and non-climatic stressors. The majority of planned adaptation activities have been concentrated on implementing change with improved technologies, building capacity (for example, through training programs on climate change awareness and adaptation governance), providing alternative livelihoods to improve food security, reducing the effects of flooding on communities through disaster risk reduction and rural-urban development actions and improving ecological functions and services to provide sustainable access to natural resources.

According to data from a household survey conducted in 2016 (DECCMA 2018), approximately 75% of households in the Volta Delta have implemented one or more autonomous adaptation strategies. The main adaptation tactic used by households involves changing how much labour is used, which may involve hiring help or having women start working outside the home. Additionally, changing the layout of a home or moving is a common practice. Houses are typically constructed

of flimsy materials and may call for periodic modification or total abandonment over time. Investments in financial capital typically take the form of loans, insurance, or membership in cooperatives.

Due to the communities' attachment to their location and primary source of income which is fishing, earlier attempts to resettle the Keta area before independence failed (Akyeampong 2002). Three communities in Keta-Adzido, Vodza, and Kedzi were the subject of a comprehensive resettlement plan that the government launched in 1996 (Akyeampong 2002; Afram et al. 2015). Resettled communities, according to Afram et al. 2015, are generally content with the housing amenities offered but are unhappy with the living conditions. People especially prefer to live close to their extended families and to have spaces nearby for gatherings like weddings and funerals. Loss of family and cultural ties, violations of people's basic human rights, and disregard for community cohesion result from failure to take into account these cultural and familial contexts (Danquah et al. 2014). As a result, retreat management has been employed to help the population in the Volta Delta to cope with the situation. Although managed retreat has long been acknowledged as a viable adaptation technique and has been employed to mitigate floods and other hazards, it is frequently regarded as a last choice, to be utilized only in situations when risk reduction or in situ adaption methods are either unfeasible or excessively expensive (IPCC 2007; Siders 2019; Anderson et al. 2020). Retreat naturally generates opportunities and losses at the same time.

People can experience less pain and be able to work through their loss and grief in an adaptation retreat by deliberately loosening their attachment to a particular place and context, selecting aspects to keep, and proactively forming new relationships in a different location (Shear et al, 2007). This study therefore examined the relationship between flooding and anxiety among a population that has long practised managed retreat to mitigate the effects of floods.

1.2 Statement of the Problem

The Volta Delta is a dynamic environment that is rich and ever-evolving in both time and space (Dada et al. 2016). Natural forces driving change in the biophysical conditions of the delta system include rainfall variability, marine and riverine flooding, drought, sea-level rise, storm surges and elevated temperatures (Appeaning Addo et al. 2018). Climate variability has altered when the rainy season begins. However, the Volta Delta frequently floods during the rainy season due to increased rainfall intensity.

Floods harm the environment, endanger lives, destroy property and force families to relocate. Coastal flooding is also made easier by powerful swell waves, rising sea levels and storm surges assisted by relatively flat topography (Cudjoe et al. 2019). By 2017, more than 300 people had been displaced, and nearly 80 homes and a school had been destroyed in Keta. Farmers and plantation owners lost their livelihoods as a result of the erosion of farmland and plantations. In 2019, the situation worsened, with the shoreline retreating several meters inland in some areas and up to 100 meters in others.

There are increased levels of depression and anxiety among individuals who have been hit by floods in the area. Poor psychological outcomes have been linked to secondary stressors like relationship issues, and loss of sentimental items (Tempest et al, 2017).

The vulnerability and resilience of households are significantly influenced by risk perception (Rana et al, 2020). As a result, it is now more crucial than ever to take climate change adaptation and disaster risk reduction into account when assessing risk.

Place attachment is an affective evaluation that describes the relationship people form over time with their environment; this relationship can alter how people view risk or approach it.

For instance, risk perception may be decreased to avoid the risk of separation and the associated

stress (Demuth et al., 2016) and continue to think of the attachment source as a " haven" (Solvic 1987) when the source of attachment (person or place) is also the source of risk. The degree to which a person has a history with a location influences the type of attachment (Hay, 1998). People who have little or no attachment to a place, like tourists, have a strong sense of place, which is based on the attractive or enjoyable aspects of the location. Others have what is known as a partial sense of place, which includes pleasant feelings without a commitment to stay, and is still developing, but is still weak, such as young children or seasonal visitors. Long-term residents form a stronger connection known as a personal sense of place. These residents frequently have more social networks, local knowledge, and involvement in the community. Stronger still is an ancestor sense of place, the connection that forms between locals who were raised there and endures even if the person is forced to leave. The strongest connection is a cultural sense of place, where the location has a long history of association with a particular tribe or cultural group (Hernandez et al, 2007).

One of the most frequently mentioned advantages of place attachment was the feeling of belonging. It entails sensations of being rooted in a location, fitting in, or relating to others. Indeed, ties to a particular place can help us satisfy the need to belong, which appears to be among our most basic psychological needs. When they represent one's social circle or as a meeting place, places can give one a sense of belonging.

People who are attached to a place usually have positive emotions such as happiness, joy, and love when they find themselves in that place, and these are attributes that are opposite to feeling anxious (Baumeister & Leary, 1995: Pittman & Zeigler, 2007).

Numerous studies have looked at how hazards affect the mental health of the affected population such as the English Cohort Study of Flooding and Health, Mental Health Disorders due to Disaster Exposure among others, but few have looked at how place attachment and perceived

safety play a mediating role in the relationship between flooding and anxiety. In the Volta Delta, the idea of managed retreat has not been used to study such a relationship.

1.3 Research Question

This study seeks to answer the following questions:

i. How does the experience of flooding affect anxiety levels in Totope and Keta?
ii. How do people in Totope and Keta perceive their safety in the area?
iii. How do place attachment and perceived safety mediate the relationship between flood experiences and the level of anxiety among residents of Totope and Keta in the Volta Delta?

1.4 Research Objectives

The study's main objective is to advance the field of science by examining how place attachment and perceived safety affects the relationship between floods and mental well-being. Specifically, the study seeks to:

i. Explore how the experience of floods affects anxiety among the people of Totope and Keta.
ii. Assess how place attachment and perceived safety influence anxiety among the people in Totope and Keta.
iii. Examine how place attachment and perceived safety mediate the relationship between flood experience and anxiety in Totope and Keta.

1.5 Rationale

The Sustainable Development Goal (SDG) 3 talks about ensuring healthy lives and promoting well-being for all at all ages. This includes vulnerable people such as the people along the Volta Delta. The Global Burden of Disease study (2013) showed that the mental health burden had increased and accounts for more than 11% of disability-adjusted lost years and it is a burden for the health system.

Natural disasters over the years have resorted to grief, loss, trauma and fear among victims. Owing to these harsh truths, this study will not only highlight the negative impact not only on the quality of life but also the substantial inconvenience of the mental condition it leaves behind. Losses experienced (lives and properties), abandonment, food shortages and a lack of adequate counselling services to address mental health challenges affect the mental state of flood victims.

The impact of mental health has been underestimated and there is a huge gap between individuals with mental health disorders and those who are receiving or ever have received treatment (Vigo et al. 2016). This is because a significant proportion of people who suffer mental disorders as a result of their experience of an environmental hazard may be excluded.

This study will go a long way to inform policymakers not to just provide victims of floods with relief items but also to attend to their psychological needs. This study will also add to the growing knowledge of the effect of floods on the psychological resilience of people who have been affected by floods, especially in Ghana. This will help achieve SDG goal three, which focuses on ensuring healthy lives and well-being for all.

1.6 Organization of the Study

The first chapter provides a background to the study. It further describes the problem statement, rationale, research questions and objectives of the study. The second chapter evaluates relevant

literature on floods and their psychological effects. The chapter also includes the theoretical and conceptual framework that guides the research. The third chapter discusses the research design and methodology as well as the limitations of the study.

Chapter four details the background descriptions of the study respondents while the fifth chapter provides results and discussions of findings. The last chapter (six) gives the summary, conclusion and some recommendations for the predicament.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

To focus on the aims of the study, this section examines current works on flood, anxiety, perceived safety, and a sense of attachment to place. This chapter seeks to present a global view on the concept of flooding, anxiety, perception of safety, and sense of place attachment as well as some demographic and socio-demographic factors which may influence the experience of anxiety. This chapter ends with the theoretical framework and conceptual framework of the study.

2.2 Floods

2.2.1 Concept of Floods

Floods represent the single natural disaster with the greatest cost and destructive implication for countries and lead to the loss of about 50,000 lives annually while affecting about 75 million people at the global level (Mwape, 2009). Carter (1991) indicates that floods possess some key features, which are discussed below:

(i) They are protracted, brief, and come without notice, based on the type of flood (e.g., a flood that arises from a major river could take days or even weeks to develop, while flash floods occur instantaneously)

(ii) the start or speed of the flood could be gradual or sudden; and,

(iii) the floods could occur seasonally.

Floods arising from hurricanes or similar natural disasters are more contaminated compared to floods coming from potable water or rainwater (Brennan & Cole, 2009). Water contamination lies

on a spectrum ranging from potable water (Category 1) to those that are utterly contaminated (Category 3) (Institute of Inspection Cleaning and Restoration (IICRC), 2006). The IICRC then proceeds to list some Category 3 waters including ocean water, rains associated with high winds, surface or groundwater, and swelling rivers and streams. Floods as well as hurricane events cause injuries, sickness, or deaths (CDC, 2005; 2006; IICRC, 2006; Todd, 2006). Furthermore, people also experience sickness and injuries during evacuation, clean-up, and restoration activities (CDC, 2005; 2006; Sullivent, 2006; Todd, 2006).

2.2.2 Causes of Floods

Flood causes can be categorized into physical e.g., climate-related forces, and human factors e.g., deforestation and vegetation loss, and construction activities (Nott, 2006). Climate-related factors, especially rainfall, are however the most dominant cause of floods. Lengthy rainfall represents the primary cause of floods globally (Nott, 2006). Human activity impacts rivers and water bodies and influences the occurrence of floods. Deforestation leads to higher run-off, and lesser channel capacity arising from increased sedimentation rates. Floods are not deemed as natural hazards till they threaten human life or property (Nott, 2006). Landforms that are prone to flash floods are more susceptible to experiencing floods. Floods pose a threat due to the high population numbers living in flood-prone areas. The seriousness of a flood determines how long it will take for crops, pastures and social and economic life to return to normal (Nott, 2006).

2.2.3 Risk and Effects of Floods

The past ten years have seen over 55,000 lives being lost to floods globally (CRED, 2020), in addition to promoting diseases. WHO (2020) indicates that the avenues for contracting water-

borne diseases become pronounced as a result of major population displacement, a compromise to the quality of drinking water sources, as well as contact with polluted water. The water-borne diseases that affect people the most are diarrhoea and fever (Vollaard et al., 2004; Wade et al., 2004), as well as skin infections and upper respiratory infections (Bich et al., 2011; Wu et al., 2015; Saulnier et al., 2018; Watson et al., 2007). Receding floods can also create fertile environments for breeding mosquitoes and their associated illnesses like malaria and dengue (WHO, 2020).

Furthermore, the seriousness of exposure as well as pre-existing mental illness is an important predictor of psychological problems attributable to natural events (Sullivan et al., 2013). As a case in point, the effects of typhoons like forced evacuation, injury, and prior psychological health conditions have been found to cause mental health problems in Vietnam (Acierno et al., 2009). In Mexico as well, communities that suffered mass fatalities and displacement from floods and mudslides reported increased Post-Traumatic Stress Disorder and depressive illnesses (Norris et al., 2004). Adverse outcomes like loss of life, property, and employment in addition to starvation and homelessness cause mental health problems after floods (Galea et al., 2007).

Poor areas are at increasing risk of experiencing disastrous floods (IPCC 2007; UN-Habitat 2014), requiring robust evidence on the effect of floods on vulnerable populations. Studies show the negative effects of floods and hurricanes in the developed world on life satisfaction (Luechinger & Raschky, 2009), birth outcomes (Currie & Rossin-Slater, 2013), health metrics associated with disability in adults (Sastry & Gregory, 2013), psychological problems (Baryshnikova & Pham,

2019), as well as the tendency to travel after the event, and death (Deryugina & Molitor, 2020). Low-to-middle-income countries (LMICs) may however not be impacted in this manner. Most people in LMICs are more vulnerable owing to poor housing, sanitation and drainage, and erratic water supply (Baker, 2012).

Poor people suffer adverse economic and health outcomes when they experience floods. This includes destruction of their homes, loss of livelihood, and heightened risks of injury and germs (WHO 2018; Ezeh et al. 2017). Where effective social welfare programmes do not exist, the poor cope by disposing of productive assets, lessening food eaten, or putting school-going children into the workforce. Household income and consumption are negatively impacted (Bui et al., 2014; Carter et al., 2007; Dercon, 2004), as well as unemployment levels (Handa & King, 2003; Carter & Maluccio, 2003; Hoddinott & Kinsey, 2001) in the long run.

In India, natural disasters led to an increase in diseases like diarrhoea, fever and respiratory illness among young children (Datar et al., 2013). Similarly, children in Ecuador who were in their mother's wombs when severe floods occurred were found to be relatively shorter in height than those who didn't experience floods five and seven years down the line (Rosales-Rueda, 2018). Conversely, Deuchert & Felfe (2015) found that a typhoon did not negatively affect children's z-scores for weight and height in the Philippines, which are proxies for child health (Glewwe & Miguel, 2007).

2.2.4 Illnesses Associated with Floods and Water Damage

According to a global systematic review of 163 studies in 2020, an association was established between climate change and mental health. Results pointed out that 20% of flood victims were diagnosed with depression, 28.3% with anxiety, and 36% with PTSD (Cianconi et al., 2020). Additionally, in 2010 a study among flood victims in Sindh Pakistan reported a 59% prevalence in

severe Post Traumatic Stress Disorder (PTSD) and 54.4% in depression (Cianconi et al., 2020). Several health problems and illnesses are associated with floods and water damage. Brennan and Cole (2009) list these illnesses and health problems as including:

- Injury:
  - Drowning, physical trauma, wounds, scrapes (Sullivent, 2006; IICRC, 2006)
  - Bites from animals i.e., mammals, insects, and reptiles (CDC 2006)
- Infection (wounds, gastro-intestinal or respiratory) (Todd 2006)
  - Pathogens in flood waters from sewage, soil and animal waste (CDC 2006)
  - At cleanup operations (elements found in flood residues) (CDC 2006)
  - Flood area environment or at evacuation sites (food and water contamination, poor sanitation services and overcrowding) (CDC 2005; 2006)
- Non-biological contaminants
  - Carbon monoxide from machines used indoors (CDC, 2006a; 2006b)
  - Heavy metals
  - Pesticides
  - Organic compounds like petroleum or PAH (CDC 2006)
- Asthmatic or allergic attacks from living in or cleaning damp, mouldy buildings (CDC, 2006a; 2006b)
- Psychological shock and PTSD (CDC, 2002; 2006)

2.2.5 Pathogens in Flood Water

Some of the pathogens found in flood water come from sewage, farm animal wastes, and wild animals, or are those pathogens naturally living in water bodies (IICRC, 2006; Godfree, 2005). These include:

- **Parasites:** Entameba, Giardia
- **Bacteria:** Enterococci, Leptospira, Norovirus, Shigella, E. coli, Salmonella, Legionella, and Campylobacter
- **Viruses:** Enterovirus, Parvovirus, Adenovirus, Rotavirus and Hepatitis A

Contamination levels in flood water differ significantly across place and time. The nature, size, and location of contaminant sources have a direct impact on the direction and volume of flood waters. Three affected the Cape Fear watershed of North Carolina from 1996 to 2000 while a study on water quality was ongoing (Mallin 2002). It was discovered that different storms had different impacts on bacterial levels. Specifically, Hurricanes Fran and Floyd did not affect coliform bacteria presence in the watershed environment, with Hurricane Bonnie however increasing bacterial in the area. Samples tested after Hurricane Katrina showed similar increases in bacterial levels (Pardue 2005).

Several studies show that floods cause illnesses (CDC 2005; Katteruttanakul 2005; Karande 2003; Waring 2002). People whose homes were flooded were found to experience four times more illness rates, unlike those not affected by floods (Waring, 2002). Another study highlighted flood-related illnesses which, though present, were not linked to drinking contaminated water (Wade 2004). The research found an association between increased gastrointestinal conditions and contact with flood water.

A norovirus infection was also experienced in an evacuation centre, while a National Guard battalion reported increased acute respiratory illness (CDC 2005) due to its closeness to the evacuation site.

2.2.6 The African Experience of Floods

The UNEP (2006) indicates that Africa is more vulnerable to the effects of climate change than any other continent. The last decade of the 20th century saw about two (2) billion people experiencing disasters. Parker (2000) argues that all over the world, floodplains serve as important locations for human settlement, and Africa is no exception. A case in point is Egypt, where the Nile River floodplain is the location with the highest population concentration in the country. About twenty urban locations constitute prime areas for flooding in Mozambique, including settlements along the Zambezi River. Over the centuries, African communities have utilized the continent's floodplains for their benefit due to the proximity of water, and fertility of these plains (Parker, 2000). In Africa, flood events affect both the formal and informal sectors of economies, leading to challenges in assessing the direct and indirect impacts of floods. The primary damage caused by floods occurs by way of destruction to public and private buildings, as well as crops and livestock. Buildings could be partially or destroyed based on the structural integrity of the houses and the seriousness of the flood. Homeless statistics increase after floods due to the effect of floods on houses. Floods destroy infrastructural networks, which leads to disruption in transportation systems.

Floods and droughts represented about 86% of these disasters. Serious floods in Southern Africa in early 2008 led to the deaths of many people and displaced thousands more. The successive floods of 1983, 1984 and 1985 in South Africa negatively impacted the farming sector (Du Plessis, 1988). This necessitated the importation of various farming products to feed the domestic market. Furthermore, it negatively impacted grazing capacity to the point where animal production had to be reduced. Consequently, some farmers acquired no income in some areas while others suffered losses. Farmers therefore reduced their investment in farm machinery, and limited their planting activities, with their investment in fertilizer dwindling as well. Floods occurred again in 1986/87,

negatively affecting farmers and consumers alike and seriously destroying infrastructure in towns close to rivers. Stocks and irrigation land were lost; farm implements, plantations and sheds along rivers were damaged; and infrastructure was destroyed. The drinking water supply was also disrupted, requiring the institution of special measures to prevent health crises (Du Plessis 1988). These outcomes led to economic stagnation as the South African government redirected resources to respond to the floods (Nxumalo, 1984).

Climate change and rising sea levels will impact the natural environment and human society (Snoussi, et al., 2008). In Morocco, coastal zones are a key socio-economic hub, with over 60% of the country's inhabitants living in coastal cities and 90% of industries located there, making them prone to the negative effects of flooding. Parker (2000) notes that floods pose threats to life, health and population in many African countries. The intensity of the effects of floods on human settlements and activities derives from the importance of flood plains in African societies, and the resilience of African societies to disasters. The impact of flood disasters on African societies depends on how these societies degrade their environment, in addition to their vulnerability to floods and tropical storms.

The economic impacts of floods far outweigh the physical effects of the floods themselves (Parker, 2000). Food shortages occur after floods since floods destroy crops and animals (Parker, 2000). As a case in point, Sudan's floods of 1988 led to food shortages. Floods cause food shortages in several ways.

First, floods may damage food stocks if flooding extends into storage facilities or centres. Serious flooding makes transporting food difficult, which leads to insufficient food supplies and subsequent food deficit, especially in places cut off by the water. Sudan's 1988 flood is a classic example of this situation. Flooding in the Nile River from rains led to immense destruction of

property. Food production in Khartoum province alone dropped by 60%, and infrastructure destroyed ranged from irrigation canals, sewage systems, electricity, and roads to water systems. The agricultural industry also reported severe losses.

OCHA (2008) reports that over 194,103 people were affected by floods in 2007 in Southern Africa. The numbers included 60,995 people in Malawi; 94,760 in Mozambique; and over 31,848 in Zambia and Zimbabwe. Also, Lesotho saw about 4,000 persons being impacted, with Swaziland recording 2,500 people. About 1,200 families experienced disruption to their livelihoods and food security in the northeastern region in 2008 because their farmlands were destroyed by floods (IRIN 2008). Floods affected countries like Ghana, Nigeria, Cote d'Ivoire, Kenya, Sudan, Mauritania, Mali, Senegal, Uganda, Sierra Leon, Togo, Burkina Faso, Gambia, Guinea, Liberia, Berlin, Rwanda, Ethiopia, and Algeria (Theron, 2007). Further, approximately 300 people in 20 countries lost their lives due to floods across a two-month period, with the inaccessibility of affected areas creating challenges in accurately accessing the death toll (Theron, 2007).

Floods that occurred during harvest time in Ivory Coast led to crop losses (Theron, 2007). The soil fertility was also compromised by the floods, lessening future harvests. This ultimately led to disease outbreaks in the long term. Development efforts in African societies are also stemmed by floods, as people are displaced and infrastructure is destroyed, making it difficult to achieve the global developmental agenda (Theron, 2007).

Khandlhela and May (2006) show that vulnerability to floods depends on socioeconomic and political factors. Floods in southern Africa caused deaths, and destruction to assets (Adamson, 1983). A large chunk of the town was washed away by the flood, with 100 lives lost. Further, bridges and irrigation schemes were damaged as well. The heavy rains of January, 1974 also

negatively impacted agriculture in the central regions of South Africa (Adamson, 1983). All these go to show that floods have significantly impacted the African continent.

2.3 Anxiety

2.3.1 Concept and Definition of Anxiety

'Anxiety' derives from the Latin root word "angere," meaning distress (Sharma & Sharma, 2015). It is a feeling caused by stressors and worsened by lengthy stress (Lazarus & Folkman, 1984). Anxiety is the "anticipation of future threats" often linked to "vigilance in preparation for future danger and cautious or avoidant behaviours" (American Psychiatric Association, 2013). It is a kind of psycho-physiological difficulty encountered by people (Callahan, 2001). Harris and Coy (2003) define anxiety as a feeling made up of uneasiness and ambiguity which occurs when a person considers an event to threaten their self-esteem or ego. Anxiety engenders feelings which heighten the nervous system (Spielberger, 1983). This makes it difficult for people affected by anxiety to lead normal lives and interferes with their everyday activities. Rachel and Chidsey (2005) list it as part of the spectrum of emotional and behavioural conditions. Anxiety comes in different forms, including unnecessary worrying, fear, agitation, heightened emotional reactions, and undesirable thoughts (Vitasari et al., 2011).

It has been said that everyone has or will experience anxiety at different stages in life, which could even be normal in certain instances (National Anxiety Foundation, 2005).

Anxiety occurs when people report heightened fear and then respond to signals indicating a real or imaginary present or past threat (Craske et al., 2009). Anxiety disorders possess the features associated with heightened distress and mental arousal (Breuer, 1999). Anxiety consists of uneasiness and doubt which typically occurs when people consider something as threatening their ego or self-esteem (Sarason in Harris et al., 2003). For Spielberger (1995), anxiety involves tension

and apprehension which affects the nervous system. Feeling anxious can interfere with how well people perform by blocking their minds, affecting attention resources, inhibiting cognitive ability, causing worry and fear (Vitasari et al., 2011).

2.3.2 Types of Anxiety

Anxiety can be categorized into state anxiety and trait anxiety. In relation to state anxiety, it refers to a momentary emotional state which conveys a person's understanding of an event that causes stress at every point in time. Trait anxiety on the other hand concerns the stable individual differences which determine whether people will get anxious or not (Spielberger, 1983). State anxiety is "the emotional state of an individual in response to a particular situation or moment that includes symptoms of apprehension, tension, and activation of the autonomic nervous system, and can include tremors, sweating, or increased heart rate and blood pressure (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Trait anxiety is the tendency of an individual to respond to stress with state anxiety (Bisson, 2017). Another type of anxiety, normative anxiety, may include being concerned about issues such as money, health, and/or family problems, but those with an anxiety disorder are extremely worried about these or other things, even when there is little or no reason to worry about them. They are very anxious about getting through the day, have a negative outlook, and think that things will go wrong (Robinson et al, 2013).

Anxiety disorders feature excessive fear or anxiety that persists beyond developmentally appropriate lengths of time. These disorders cause clinically significant impairment or distress in important areas of functioning (American Psychiatric Association, 2013). The different types of anxiety disorders are categorized by the type of objects or situations that cause the anxiety and can have different ages of onset (American Psychiatric Association, 2013). One type of anxiety is social anxiety, which is marked by fear or anxiety about social situations in which individuals feel

that he/she will be scrutinized by others. Social anxiety has been found as a barrier to developing social ties in several studies (Brook & Willoughby, 2015; Goguen, Hiester, & Nordstrom, 2010; Pascarella & Terenzini, 2005). This type of anxiety is found to be more prevalent in college students, ranging from ten to thirty-three percent, when compared to the general population, ranging from seven to thirteen percent (Russell & Shaw, 2009).

In the conceptualization, individuals with high levels of anxiety generally hold heightened levels of trait anxiety, but in evaluative situations, the state anxiety also elevates (Vistari et al., 2011). To meet the criteria for an anxiety disorder diagnosis, the individual must experience excessive anxiety and worry that he/she finds difficult to control for at least six months to the extent that it causes significant distress or impairment in functioning. The individual must also experience three or more of these symptoms: sleep disturbances, difficulty concentrating, restlessness, fatigue, irritability, and muscle tension (Bisson, 2017).

Erica (2010) ranked anxiety into four levels: mild, moderate, severe and panic anxiety.

1. Mild level anxiety is healthy. At this level, the perceptual field is heightened, pupils dilate to accommodate much light, hearing and smelling intensify, and sense of touch is highly sensitive. The individual is highly alert and attentive and learning and cognition is in its best state.
2. Moderate level anxiety on the other hand is unhealthy, the perceptional field of a person at this level is narrowed. Individuals experiencing this level of anxiety have selective inattention. They have decreased focus, and automatism can be observed as repetitive purposeless movements such as shaking of the hands and feet, twirling of hair and, tapping of fingers.
3. Severe level of anxiety is characterized by reduced perceptual field and a difficulty in communication. Gross motor movements, such as pacing are characteristic of people at this

stage. Communication with such persons should be kept short and simple since communication is altered. Performance at this stage is reduced.

4. Panic level of anxiety is the worst and most severe form of anxiety. Total disruption of perceptual field is present. It is also characterized by loss of ability to communicate, loss of rational thought, and total loss of conscious thinking. Performance at this level is very poor since the person is unable to remember exactly what he/she is supposed to do.

The American Psychiatric Association (2000) has also categorized anxiety into several psychiatric disorders as follows:

(1) Generalized Anxiety Disorder: Individuals who suffer this condition live each day in a state of high tension, feeling uneasy, and tend to overreact even in mild stresses. The individual finds it difficult to concentrate instead of worrying about potential problems.

(2) Panic Disorder: This is characterized by episodes of acute and overhauling apprehension to terror. It begins abruptly and reaches a peak within 10 minutes with such symptoms as perspiration, muscle tremors, faintness and shortness of breath. Eventually this fear intensifies and interferes with everyday activities thus disrupting concentration, and decision-making, resulting in poor performance.

(3) Agoraphobia: Involves intense fear and anxiety of any place or situation where escape might be difficult, leading to avoidance of the situation such as being alone outside the home, travelling in a car, bus, aeroplane, writing an examination or being in a crowded place (Kessler et al., 2005).

(4) Phobias: It is a persistent fear of a specific object or situation. The fear occurs when the phobic individual is brought in contact with the object or situation.

(5) Obsessive-Compulsive Disorders: Individuals with this condition feel compelled to think about things they would rather not think about or perform acts they do not wish to carry

out. Obsessions are persistent, irresistible urges to carry out certain acts or rituals. Obsessive thoughts may be linked with compulsive acts. People with this disorder are preoccupied with these irrelevant thoughts they cannot control, thereby negatively impacting their lives.

(6) Post-Traumatic Stress Disorder: It is a type of anxiety that occurs after a frightening event or situation. This affects performance because some people continue to dwell on their past failures and are unable to face new challenges before them. These people often perform poorly because they fail to concentrate on new challenges.

2.3.3 Effects of Anxiety

Some longitudinal studies have demonstrated that untreated anxiety in adolescents and young adults may lead to several behavioural, physical, and mental difficulties (Mahmoud, Staten, Lennie, & Hall, 2015). Hypertension, coronary heart disease, alcohol dependence, nicotine addiction, depression, and suicidality are some of the complications that may be experienced by those with untreated anxiety (Boden et al., 2006; Goodwin et al., 2004; Sonntag et al., 2000; Stein et al., 2001; Volgelzangs et al., 2010; Yan et al., 2010). These difficulties and complications harm those experiencing them and can worsen anxiety, making it challenging for students to be successful.

Furthermore, untreated anxiety may lead to pathological anxiety disorders (Emilien, Durlach, & Lepola, 2002). Many individuals who have symptoms of anxiety also have symptoms of depression. According to the American Psychiatric Association (2013), "Individuals whose presentation meets criteria for generalized anxiety disorder are likely to have met, or currently meet, criteria for other anxiety and depressive disorders".

2.4 Place Attachment

2.4.1 Concept and Definition of Place Attachment

According to Low and Altman (1992) "Place" refers to space, that has been given meaning through personal, group or cultural processes". "Place comes into existence when people give meaning to a part of the larger, undifferentiated space in which they live" (Jack, 2010). Place attachment is "a positive affective bond between an individual and a specific place, the main characteristic of which is the tendency of the individual to maintain closeness to such a place" (Hidalgo and Hernandez, 2001). Place attachment encompasses long-standing connections between people and physical places like homes (Brown & Perkins, 1992). A sense of pride is usually associated with residential place attachment concerning how a residential area feels and looks (Twigger-Ross & Uzzell, 1996), in addition to eliciting feelings of wholesomeness (Harris et al., 1995).

From the day-to-day interactions people have with the environment and their neighbours, periodic events, daily upkeep of the environment, and affection for home and the area, place attachment gradually grows (Werner et al., 1993). Residential attachment ensures security, stability and familiarity. Place attachments, however, change with time as people grow, the environment changes, and activities in the environment change. Numerous neighbourhoods decline because houses grow, homes are rented, and poor people move into neighbourhoods (Myers, 1983).

The evolving housing and neighbourhood conditions influence place attachment. Research has shown that place attachment is important in promoting revitalization in severely distressed neighbourhoods where houses have been abandoned by landlords. Residents who pursued revitalization in neighbourhoods were attached to their neighbourhoods irrespective of the poor conditions in these neighbourhoods (Saegert, 1989), and engaged in activities like collecting rent, ensuring repairs were conducted, and lobbying government authorities to improve their communities. When neighbourhoods decline, people leave, and new tenants move in (Myers, 1983).

Though some residents stay because of the inability to leave (Stokols & Shumaker, 1981), others on the other hand become attached over long periods of stay (Taylor, 1996). Residents portraying a high incidence of place attachment are usually older (Lawton, 1990), spending considerable amounts of time in the neighbourhood (Fuhrer et al., 1993). Investing in buying a home also improves conditions in neighbourhoods as well as people's attachment to it (Taylor, 1996). People who own homes stay longer in an area than renters (Rohe & Stewart, 1996), have close relationships with their neighbours (Fischer, 1982), are involved in community activities (Rossi & Weber, 1996), and stay longer in poor neighbourhoods (South & Crowder, 1997). People who rent for short periods have few connections that encourage them to stay and improve a neighbourhood. Home ownership and long stay therefore promote greater place attachment.

2.4.2 Factors Influencing Place Attachment

The places we live in and visit hold deep meaning for us and evoke strong emotional attachments in us. Relph (1976) indicates that: "there is for virtually everyone a deep association with and consciousness of the places where we were born and grew up, where we live now, or where we have had particularly moving experiences. This association seems to constitute a vital source of both individual and cultural identity and security". Furthermore, a significant overlap exists "between factors such as emotional bonds, affiliation, behavioural commitment, satisfaction and belonging, which are loosely associated with theoretical descriptions" of place attachment (Pretty et al., 2003).

Place attachment involves different aspects of the bond between people and a place, like behaviour, affect and cognition. This includes the interaction between factors like emotions, knowledge, beliefs, and behaviours regarding a location (Altman & Low, 1992). The satisfaction experienced regarding a place leads to the development of affective bonds since places allow for control,

engender creativity and allow for a sense of peace (Altman & Low, 1992). Bonds are also affected by factors like duration of living in a place, role played in the area, and availability of connections in the area (Moore, 2000). Social relations are therefore important in building attachment. Altman & Low (1992) support this position by saying: "… attachments may not only be to landscapes solely as physical entities but may be primarily associated with the meanings of and experiences in place which often involve relationships with other people" (Altman & Low, 1992).

2.4.3 Importance of Place Attachment

Orr (2005) states that "knowledge of a place where you are and where you come from is intertwined with knowledge of who you are". At least two interpretations can be ascribed to this quote. The first is that people with an emotional attachment to a place have a greater likelihood of deepening their knowledge of the place and their roots. The second interpretation is that place attachment leads to the creation and sustenance of a person's identity. Place attachment therefore leads to the expansion of personal knowledge and identity (Lewicka, 2008; Orr, 2005).

Place attachment is important for individuals' psychological balance (Lewicka, 2008). Connection to a place enables people to be stable and adapt easily to changing conditions. Particularly for elderly people, place attachment gives them a sense of identity and self-esteem (Rubinstein and Parmelee, 1992). This is important in these times, especially when social bonds and traditional values are loosening. Similarly, many people are relocating, further weakening their roots (Jack, 2010). To illustrate, a study reported by Jack (2010) shows how children without place attachment lacked a sense of grounding and self-identity. Similarly, emotional bonds with a place engender feelings of safety in people attached to the place. This security arises from familiarity with the place; either with its facilities or through the psychological buffer provided in difficult times (Jack, 2010).

Orr (2005) argues that differences exist between residents and inhabitants. Residents have weak connections with places they stay at and are not knowledgeable about or hold the place dear. Conversely, inhabitants share a deep connection with a place, which shows in the very core of their being. Inhabitants generally have greater connection to a place and make it a good place to live in. Environmental behaviour encompasses ways of living that are sustainable (Vaske and Kobrin, 2001).

Increased place attachment has been shown to increase helpful attitudes towards the environment (Kudryavtsev et. al., 2012). A significant correlation was found between neighbourhood attachment and pro-environmental behaviour (Rioux, 2011). Vaske and Kobrin (2001) discovered higherplace identity to be associated with positive affection towards the environment. The development of place attachment has also been found to contribute to environmentally responsible behaviour (Halpenny, 2006).

Vorkinn and Riese (2001) also found place attachment to positively influence residents' attitudes towards environmental changes in their community. This means that lesser place attachment led to a reduction in the overall value or quality of a place. Communities can therefore be negatively impacted environmentally and socially owing to an absence of a sense of place (Semken and Freeman, 2008). Developing place attachment allows societies to develop responsible citizens (Vaske and Kobrin, 2001). This can be achieved by introducing children first to the environment, and growing empathy in them towards the environment, which should begin from places closer to home and school (Sobel, 1996). With time, they can then start working towards exploring other places in the environment. Without developing this initial love for the environment, knowledge of what it suffers from and ways of addressing the problem will be difficult to grow in.

Orr (2004) defines biophilia, and says that pure love must be present for biophilia to grow.

Biophilia is a close relationship with the environment or with nature (Orr, 2004). It also includes people's interactions with each other and memories about a place. It can therefore create a strong bond among people (Low and Altman, 1992).

2.5 Perceived Safety

2.5.1 Concept of Perceived Safety

Safety perception (or perceived risk) refers to the prospect of unwanted outcomes occurring (Hamed & Al Rousan, 1998). Perceived safety concerns people's perception of "the risk of becoming a victim of crime and disturbance of public order" (Uittenbogaard et al., 2018). The possibility of becoming a victim, and becoming one, are real encounters for people (Halbur, 2010; Uittenbogaard et al., 2018). An evaluation of risk perception varies from person to person based on their background and their approach to handling risks (Adams, 1988).

The need to be safe is surpassed only by the physiological need (food, shelter). Therefore, the safety sentiment leads to the attainment of higher emotional needs in promoting well-being (Mouratidis, 2019). Research also shows that an optimistic perception of safety contributes to positive health outcomes, especially in neighbourhoods (Baum et al., 2009). Contrariwise, perceiving neighbourhoods to be unsafe heightens anxiety and decreases life satisfaction (Møller, 2005), which further leads to bad experiences of health by people (Chandola, 2001) and undesirable diseases (He et al., 2022). Loss of safety has been progressively considered a critical social problem (Innes & Jones, 2006; Wang et al., 2019; Makinde, 2020). This makes it imperative for urban planners to unearth the factors and mechanisms which contribute to growing unsafe feelings in the urban space (Makinde, 2020).

Perceived safety is important both at the large and small level. Perceived safety comes up frequently during deliberations on public space that is fair and just for all (Haas & Mehaffy, 2018)

as well as city life (Harvey, 2008). Safe mobility is "an individual right, to be attained by all, regardless of the individual's gender, age, abilities or resources" (Vania Ceccato, 2014). At a lesser scale, perceived safety affects people at the individual level. Individuals strive to address, and reduce, the risk of suffering adverse outcomes. Women, especially, adopt evasive measures when out and about and conceal valuable items. Other vulnerable groups like the elderly would prefer not to visit parks, or alternatively reduce time spent outside. These behavioural adjustments and restrictions on movement, and the unease and fear that accompany it, negatively impact quality of life (Jackson and Gray, 2010; Bremberg et al., 2015). This can disrupt mental health, and reduce social cohesion (Jackson and Gray, 2010).

2.6 Relationship between flood, anxiety, place attachment and perceived safety

Some research has been undertaken into the relationship between floods and anxiety or psychological distress, place attachment and perceived safety. Direct and indirect exposure to floods have been found to have several negative mental health impacts (BDI, 2021). Fernandez et al., (2015) after undertaking a global systematic review of 83 studies found that the risk of experiencing post-traumatic stress disorder (PTSD), psychological distress, depression, and anxiety increased in areas affected by floods compared to areas not affected. After studying floods in the Australian locations of Brisbane in 2011 (Alderman et al., 2013) and New South Wales in 2017 (Matthews et al., 2019), the researchers found that business owners and households which were affected by floods or evacuated experienced a higher risk of psychological distress and PTSD. Matthews et al., (2019) in particular found that Aboriginal and Torres Strait Islander people were more likely to report depression and anxiety since they stood greater chances of being evacuated or displaced. Bei et al., (2013) also found that among older adults, 1 in 6 persons affected by floods reported symptoms of post-traumatic stress disorder (PTSD) which would require clinical

treatment, as well as increased trauma symptoms.

Flood exposure also has an effect on suicidal ideation (BDI, 2021). Matthews et al., (2019) found that the 2017 New South Wales floods increased suicidal ideation among people whose homes or businesses were affected by floods. It needs to be emphasized however that some studies did not find differences in suicide rates related to floods (De Leo et al., 2013). Another study also found some evidence of flood exposure increasing alcohol, tobacco and drug use (Turner et al., 2013). Flooding has been found to also exacerbate anxiety and mental distress among people who experienced greater damages or threat of harm (Liu et al., 2006, Fredman et al., 2013), financial losses (Bei et al., 2013), and disruption to routine or employment (Bei et al., 2013, Tunstall et al., 2006). Furthermore, sudden onset of floods which give no warning prior to occurrence have been found to also increase psychological distress in communities (Munro et al., 2017; Liu et al., 2006). In the same vein, floods have been found to increase psychological difficulties for people with poorer psychological and physical health prior to the onset of the flood (Alderman et al., 2013; Ginexi et al., 2000). Also, Norris et al., (2004) found low social support to increase the onset of mental illness after floods.

Place attachment has been shown to prevent or minimize losses during disasters because it motivates people to engage in disaster awareness, planning, information sharing, mitigation, preparedness, stewardship, or activism behaviours (Anton & Lawrence, 2016; Cutter et al., 2008; Zhang, Zhang, Zhang & Cheng, 2014). Place attachment has also been shown to aid in managing rapid onset disasters like floods, wildfires and volcanic eruptions (Bihari & Ryan, 2012; Bird, Gısladottir & Dominey-Howes, 2011; Mishra et al., 2010). Residents with strong place attachment have been found to refuse to evacuate during disasters, sometimes putting their lives in danger to stay close to home (e.g., Boon, 2014; Chamlee-Wright & Storr, 2009; Fried, 2000; Paton, Burgelt

& Prior, 2008).

Li et al. (2020) found that flood experiences were significantly associated with perceived safety and anxiety. The study reported that individuals who experienced floods had a higher level of anxiety and lower perceived safety compared to those who did not experience floods. Similarly, Bubeck et al. (2013) reported that individuals who had experienced floods had a higher level of perceived safety concerns and anxiety, even after controlling for the flood's magnitude. In the same vein, Botzen and Aerts (2013) found that individuals living in areas with a higher flood risk had a higher level of perceived safety concerns and anxiety. This is supported by van der Velden et al. (2013) who report that flood experience and flood severity were significant predictors of anxiety and perceived safety. Furthermore, Mano et al. (2018) also found that individuals who had adaptive coping strategies had a lower level of anxiety and higher perceived safety compared to those who had maladaptive coping strategies. Hernandez et al. (2016) similarly find that individuals with a stronger attachment to their homes had higher levels of anxiety during and after a flood event. Kim et al. (2018) also found in their study that place attachment was positively associated with anxiety related to flood risk. The study also reported that individuals with higher levels of place attachment were more likely to experience anxiety related to the potential loss of their homes or communities. Steinführer and Witt (2015) show that the relationship between place attachment and anxiety related to floods was stronger for individuals with higher levels of education and those living in areas with a lower flood risk. Knez and Eliasson (2017) similarly show that individuals with higher levels of place attachment had lower levels of anxiety related to floods when they employed adaptive coping strategies.

In Ghana, studies have shown that exposure to floods can lead to increased levels of anxiety and stress. Agyei-Mensah et al., (2012) found that women who had experienced a flood event were

more likely to experience symptoms of anxiety, such as worry, nervousness, and fear, compared to women who had not experienced a flood. Another study found that flood survivors in Ghana experienced elevated levels of stress and anxiety in the aftermath of the disaster, with symptoms persisting for several months after the event (Adinkrah et al., 2014). In addition to direct exposure to floods, the impact of floods on social and economic well-being may also contribute to anxiety. For example, a study of flood-affected communities in Ghana found that loss of property and income was a significant source of stress and anxiety, particularly among women (Oppong & Agyei-Mensah, 2018). Furthermore, disruptions to social networks and community support structures may increase feelings of isolation and vulnerability, further exacerbating anxiety among flood survivors (Agyei-Mensah et al., 2012). Given the high levels of anxiety experienced by flood survivors in Ghana, it is important to address the psychological needs of these communities in the aftermath of a disaster. Several interventions have been proposed, including psychological first aid, counselling, and community-based interventions (Adinkrah et al., 2014). Furthermore, it is important to consider the role of gender in disaster recovery, as women may experience greater levels of stress and anxiety, and may benefit from targeted interventions that address their specific needs and concerns (Oppong & Agyei-Mensah, 2018).

2.7 Flood Management Authorities

Flood management authorities are pivotal in addressing the multifaceted challenges posed by flooding events. A comprehensive study by Penning-Rowsell et al. (2013) delves into the roles of flood management authorities in Europe. The research highlights the diverse functions these authorities undertake, encompassing flood risk assessment, infrastructure maintenance, and community engagement. Additionally, it underscores the necessity of collaboration between national and local authorities in effective flood management.

Authorities in charge of flood management should prioritize community interaction, according to research by Kreibich et al. (2017). It talks about how communicating flood risks and running public awareness programs can improve community resilience. The study emphasizes how authorities can considerably lessen community susceptibility to flooding by actively educating communities.

Merz et al. (2010) examine flood control infrastructure and the role that flood management agencies play in preserving and modernizing flood defenses. The study emphasizes how important it is to have well-maintained infrastructure if you want to lower your risk of flooding and increase community resilience. Communities' resistance to flood disasters is examined by Botzen et al. (2019), who also evaluate the efficacy of flood management authorities. The study highlights the necessity of adaptive flood risk management techniques that increase community resilience to shifting climatic trends while simultaneously reducing susceptibility.

To sum up, flood control authorities have a variety of responsibilities when it comes to reducing the likelihood of flooding and building community resilience. Empirical studies suggest that their efficacy is contingent upon cooperative endeavors, community involvement, upkeep of infrastructure, and adjustment to dynamic environmental obstacles. The importance of flood management agencies in developing long-term flood risk management strategies is highlighted by these research.

2.8 Theoretical Framework

The theoretical framework for this study is a blend of two theories. Namely the Social Vulnerability theory and the Conservation of Resources (COR) theory (Hobfoll, 1998). Social vulnerability theory is a framework that examines how social factors such as race, class, gender, and other forms of social inequality influence people's ability to prepare for, cope with, and recover from disasters. According to the theory, social factors create unequal access to resources, power,

and social support, which increases vulnerability to the impacts of disasters (Cutter et al., 2003). The COR theory focuses on the resources of both individuals and groups, and provides a thorough framework for evaluating the impact of evaluation on emotions and performance. This study adopts these two theories. The theory has been widely applied in the field of disaster research and has been used to understand the disproportionate impact of disasters on marginalized groups. Researchers have found that social vulnerability can vary depending on the context of the disaster, the characteristics of the population, and the level of social inequality present in the community (Wisner et al., 2004). Therefore, social vulnerability theory emphasizes the need to address underlying social inequalities to reduce the impact of disasters and build resilience in communities. According to COR theory, human people are primarily motivated to create, maintain, and grow their resource bases in order to safeguard their own well-being and the social ties that support it. The idea offers a framework for avoiding resource depletion, preserving existing resources, and accumulating resources required for adopting optimal actions. According to the COR hypothesis, resources are crucial in influencing whether people perceive events as stressful and how they are able to handle stressful circumstances. Events in a person's life that are traumatic or disruptive have the potential to deplete their personal and environmental resources as well as their psychological well-being.

2.9 Conceptual Framework

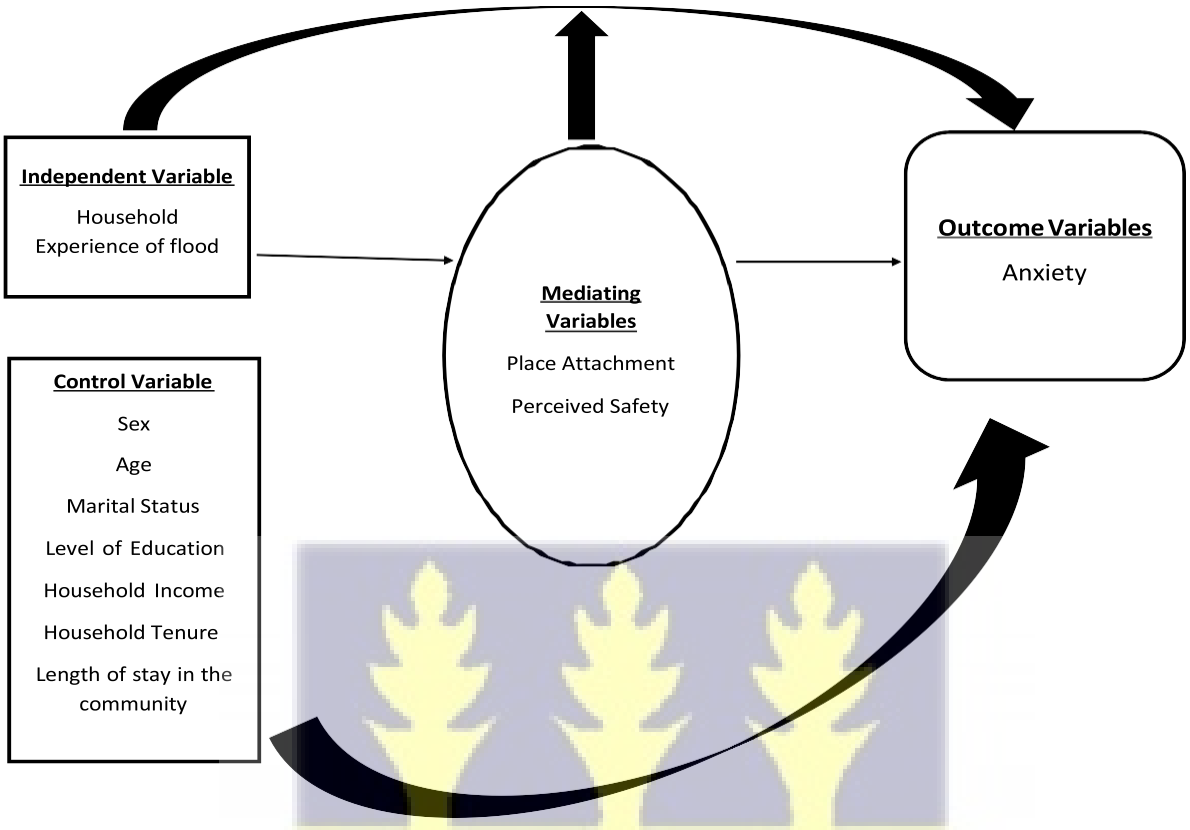


Figure 2.8: Conceptual framework showing the relationship between the experience of flood and anxiety.

Figure 2.8 above shows the relationship existing between experience of flood and anxiety. Based on the diagram, the main independent variable Household Experience of Flood may have a direct impact on anxiety (outcome variable). On the other hand, the independent variable along with the mediating variables (placed attachment and perceived safety) may also result in anxiety. The control variables (age, sex, marital status, level of education, household income, household tenure and length of stay in the community) can also have a direct impact on anxiety. In all, a combination of the independent variables, control variables and mediating variables also have an impact on anxiety.

2.10 Hypotheses

H1: Households with a higher experience of floods will report higher levels of anxiety.

H2: The relationship between the experience of floods and anxiety is mediated by the level of perceived safety.

H3: The relationship between the experience of floods and anxiety is mediated by the level of place attachment.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the study design and methodology used in the study. The chapter also presents information about the study area as well as some important demographic and geographic information, source of data for the study, sample design, description of variables, analytical methods, and limitations associated with the data.

3.2 Study Area

The Volta Delta falls within the southeastern coastal plains climatic zone. The study was conducted in Keta and Totope, located along the coast of Ghana and are found in the Volta and Greater Accra Regions respectively.

Keta is located in the Keta Municipality. The Municipality is located between Latitudes 5.45°N and 6.005°N and Longitudes 0.30°E and 1.05°E. It is about 160 kilometres from Accra, and is situated to the east of the Volta Estuary. Its shared borders with the South Tongu District to the west, the Gulf of Guinea to the south, Ketu North and South District to the east, and Akatsi South District to the north. The Municipality has a total surface area of 753.1 km2. The Keta Lagoon, which is the largest lagoon in Ghana, is the largest of the bodies of water. Keta is one of the communities in the municipality which has experienced an increased rate of erosion and flooding, with more than half of Keta and its surrounding towns under water (Ile et al. 2014). This makes Keta one of the eligible communities for this study. According to the 2021 Population and Housing Census, Keta Municipality has 78,862 residents or 5.0% of the total population of the Volta Region. Males make up 46.8% of the total population of the Municipality while females make up 53.2%. Urban areas are home to more than half (60.8%) of the residents of Keta Municipality. The

Municipality's sex ratio is 88.3, which indicates that there are 88 males for every 100 females.

The Keta municipality is also blessed with some tourist attraction sites such as the Ramsar site, because it offers refuge to a variety of birds, both migratory and resident, particularly waterfowl. Several thousand migratory birds that travel the South Atlantic and Mediterranean flyways are said to meet at the Anlo- Keta Ramsar site. There are many different species of terns, gulls, and pelicans that nest, rest, feed, and breed there. There are many miles of pristine, distinctive golden beaches in the nation that can serve as tourist-friendly retreats. The beaches, which are bathed in brilliant sunshine, have sands with different sizes of grains, from fine to coarse.

Totope on the other hand is located in the Ada East District. The district, which is part of the Greater Accra Region has a total land area of 289.783 acres (square km). It is located at an elevation of 42 meters above sea level. Totope is a community that is sandwiched between the ocean and the Songhor Lagoon. It has a population of a little over 3000. The main occupation in this community is fishing. Totope is one of the communities located along the Volta Delta, which is constantly experiencing flooding (Gampson et al. 2017).

One of the issues Totope is confronted with is access to good drinking water. Pipe-borne water is not available in the community. The main source of drinking water is from shallow wells and sachet water. Amounts of land that were once dry enough for the Totope villagers to cultivate crops, construct homes, and raise families have been overtaken by the ocean. Totope which was a nesting site for endangered turtles and a habitat for migratory birds is being destroyed. It is one of the flood-prone coastal areas in Ghana making it a suitable place for the study.

3.2 Data Source

The data used for this study is the data collected by the Evaluating Health Impact of Climate

Adaptation Strategies (EHICAS) project at the Regional Institute for Population Studies, University of Ghana. The data was collected in December 2021. The study employed a cross-sectional design, a scientific approach crucial for capturing the experiences of diverse communities within the same time frame, thereby avoiding the variations that could arise at different times and seasons. The objective of the study was to gather information from communities affected by floods, their adaptation strategies, and health- related issues emanating from flood adaptation strategies employed in the study communities and how these factors interrelated.

3.3 Sample Design and Selection

The sample size for this study was 500 households but ended up collecting data from 505 household in Keta and Totope. The unit of analysis for this study is the household member responding to the questions. There were two main stages of sampling: the sampling of the study communities and the sampling of the individual respondents. For the study communities, the study targeted communities that have been affected by floods over the years and have also received some intervention from the government about the flood hazard. Both Keta and Totope were selected because of their history with flood hazards and managed retreat over the years to cope with the situation. Also, scientists on the project have had previous projects in Keta and Totope, so that made it prudent for them to select these two communities over other communities that have similar characteristics in the Volta Delta.

In terms of the selection of participants for the study, a household listing was conducted in the two project locations to first identify individual household members who were aged 18 years and above. In Keta, the household listing was done in Kedzikope and Havedzi. However, because Totope is a small village, the listing was done in the entire village. After the listing, individual

household members aged 18 years and above were randomly selected for the study. The sampling was done by taking into consideration the sex of the respondents, and also ensuring that not more than two members of the same household were selected to participate in the study.

All those who were selected for the study were interviewed in person using computer aided personal interview (CAPI).

3.5 Variables

To carry out this study, some variables were listed as independent variables, others as intermediate variables, and some listed as dependent variables.

3.5.1 Dependent Variable

The dependent variable in this study is the anxiety levels of the respondents. To measure anxiety, respondents were asked if they felt anxious or on edge with regard to their flood experience. The responses are scored and scaled using the General Anxiety Disorder (GAD-2) scale. The GAD-2 is a very quick measuring tool, and it only contains two questions that are directly related to the symptoms of anxiety disorders. The questions asked are:

When thinking about flood management activities do you feel the following:

- Feeling nervous, anxious, or on edge
- Not being able to stop or control worrying

With 4 response categories, "**not bothered at all**", "**Occasionally bothered (once or twice a week)**", "**Occasionally bothered (once or twice a month),**" and "**Extremely bothered (nearly every day)"**. The GAD-2 scale reads from 0 to 6. A GAD-2 score of between 0 to 3 is regarded as a diagnosis of mild anxiety. Without additional methods or therapies, the level of anxiety that the

majority of us experience in our daily activities is manageable. A GAD-2 score of 3 or higher is a reliable indicator of an anxiety disorder in the clinical setting. The scores were categorized into two, no sign of anxiety and signs of anxiety.

3.5.2 Independent Variables

The main independent variable for this study is the household experience of flood. This is measured by asking the respondent to circle which of the responses below reflects their current situation:

- In my current residence, I have not been affected by flooding
- In my current residence, I have been indirectly affected by flooding i.e., flooding has never entered my house but I have suffered temporary disruption such as disruption to services like gas, electricity, water, transportation and / or disruption to daily life such as school, health centre, shop closures etc.
- In my current residence I have been directly affected by flooding with water entering my home.

Those who circled the third and second responses were put together as having experienced flood. This study also uses some demographic and socioeconomic indicators as predictor variables. The listed demographic variables used in this study are sex, age, and marital status. The sex of the respondents was split into male and female. The age of respondents was used as a continuous variable. Marital status was recategorized as never married, married, and formerly married. Single respondents were those who had never been in a relationship at the time of the study. The married category includes people who were either married or living with their partners, while the formerly married category includes those who were either widowed, divorced, no longer living together, or

separated.

Level of education, household tenure, and annual household income are the socio-economic factors that were employed in this study. In the data, the level of education was divided into no education, primary, secondary, and higher. Household tenure was recategorized into renting, owner-occupier and living with family/friends. The household annual income was also recategorized into below GHc 10,000, GHc 10,000 to GHc 20,000, and above GHc 20,000.

Other variables used as predictors are the length of stay in the community and the perception of trust in flood management authorities in Totope and Keta. The length of stay was split into five exclusive categories, less than 1 year, 1 to 5 years, 6 to 10 years, and more than 10 years of stay in the community. The perception of trust in flood management authorities was measured as a composite score ranging from 4-20. The scores were then categorized into 3. Those who trust flood management authorities, those who neither trust or do not trust management authorities, and those who do not trust management authorities at all.

Questions used in the composite scoring for the perception of trust in flood management authorities are; 'if flood management authorities behave in an honest manner, if they acted in a socially responsible way, if they felt the information provided by the flood management authorities was honest and if the flood management authorities are good and kind'

3.5.3 Mediating Variables

This study identifies two variables that act as either enabling or deterring factors to the experience of anxiety by the respondents. These variables are respondents' sense of attachment to the place and how they perceive their safety in the community in relation to flood management activities.

To measure perception of safety, the questions below were asked.

- When thinking about flood management activities, I feel safe in my community.
- When thinking about flood management activities, I feel safe in my home.
- I feel much safer about future flooding events because of the flood management activities that are happening in this community.

These questions were measured as strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. The questions were added to get a cumulative score with a range from 3-15 and the mean for the scores was calculated to measure the perception of safety. The scores were categorized into do not feel safe, feel neither safe nor unsafe, and feel safe. Respondents who scored 1 and 2 were placed in category 1 "Do not feel safe", those who scored 3 were placed in the 2nd category "Neither feel safe or unsafe", then respondents who scored 4 and 5 were placed in the third category which is "Feel safe".

To measure the sense of attachment to place, the questions below were asked.

- The local area where I live is a scenic place
- The local area where I live is a place of environmental quality
- The local area where I live is a family place
- The local area where I live is a very peaceful place
- The local area where I live is a good place for employment
- The local area where I live has good services and amenities
- I feel very attached to the local area where I live
- I feel very attached to my home.

These questions were measured as: strongly disagree, disagree, neither agree nor disagree, agree and strongly agree. The questions were added to get a cumulative score with a range from 8-40

and the mean for the scores was calculated to measure the sense of attachment to place. The scores were categorized into 3 groups, do not feel attached to the community, feel attached or not attached to the community, and feel attached to the community. Respondents who scored 1 and 2 were placed in category 1 "Not attached to place", those who scored 3 were placed in the 2nd category "Neither attached to place or not", then respondents who scored 4 and 5 were placed in the third category which is "Attached to place".

3.6 Method of Analysis

Stata version 17 was used for the analysis, and frequency tables were created by exporting the analyzed data to Excel. Three levels of analysis; the univariate, bivariate, and multivariate levels were performed.

Descriptive analyses were conducted at the univariate level to illustrate the characteristics of respondents using frequencies and proportions. The percentage distribution of respondents was displayed using pie charts, graphs, and tables according to their age, marital status, educational level, the household tenure system, and annual household income.

Cross tabulations were used to examine associations between two variables, such as an independent and a dependent variable as well as an intermediate variable and a dependent variable, at the bivariate level. The Pearson chi-square test of significance was used at a 95% confidence level to determine whether or not there was any statistical significance among these variables.

A binary logistic regression was used to describe the relationship between the dependent variable and the independent variable as well as the mediating variables.

Demographic variables such as sex, age, marital status, educational level, the household tenure system, and annual household income were all tested to determine their association with

experience of anxiety. Intermediate variables, including the sense of attachment to place and perceived safety, were also tested in order to establish whether an association exists between them and anxiety disorders among the study population. In all, three models were analysed.

Model 1: Examine the relationship between flood experience and anxiety. Binary logistic regression was used to predict the relationship between individual's experience of flood and anxiety disorders.

Model 2: Examine the relationship between perceived safety, sense of place attachment and anxiety. Binary logistic regression was used to predict how likely an individual may experience the outcome variable as a result of the mediating variable on the independent variable.

Model 3: Examine the relationship between the independent variable, the mediating variables, the control variables, and anxiety. Binary logistic regression was used to predict how likely an individual may experience the outcome variable as a result of the mediating variable and control variables on the independent variable.

CHAPTER FOUR

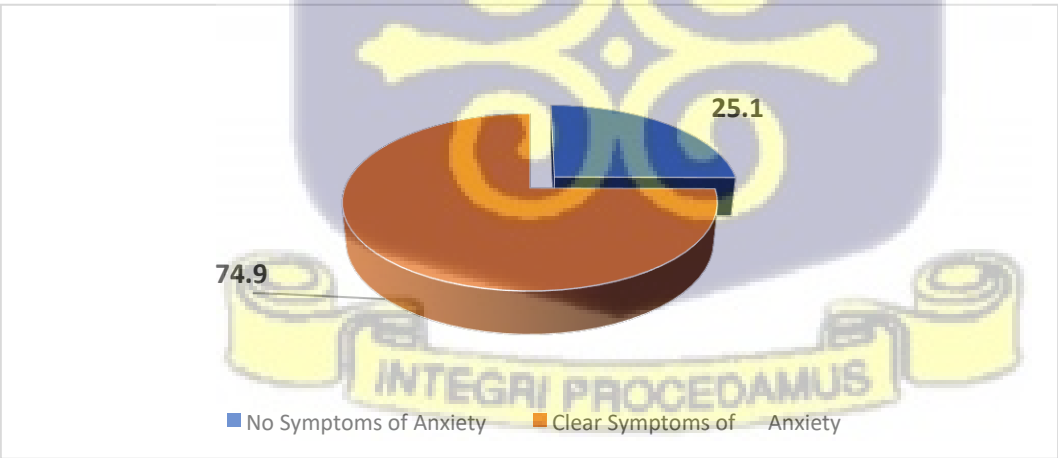
UNIVARIATE AND BIVARIATE ANALYSIS

4.1 Introduction

This chapter provides information on the demographic and socio-economic characteristics of the study population. The chapter is divided into two sections. The first section which is the univariate analyses are presented in charts, graphs, and tables and covered the following variables: marital status, ethnicity, educational level, marital status, household tenure, household income, and source of drinking water. The second section examines the bivariate relationship between each independent variable, intermediate variable, and outcome variable. At a 95% confidence level, the association between each independent, intermediate, and dependent variable is tested using Pearson's chi-square test statistic.

4.2.1 Experience of Anxiety among Respondents

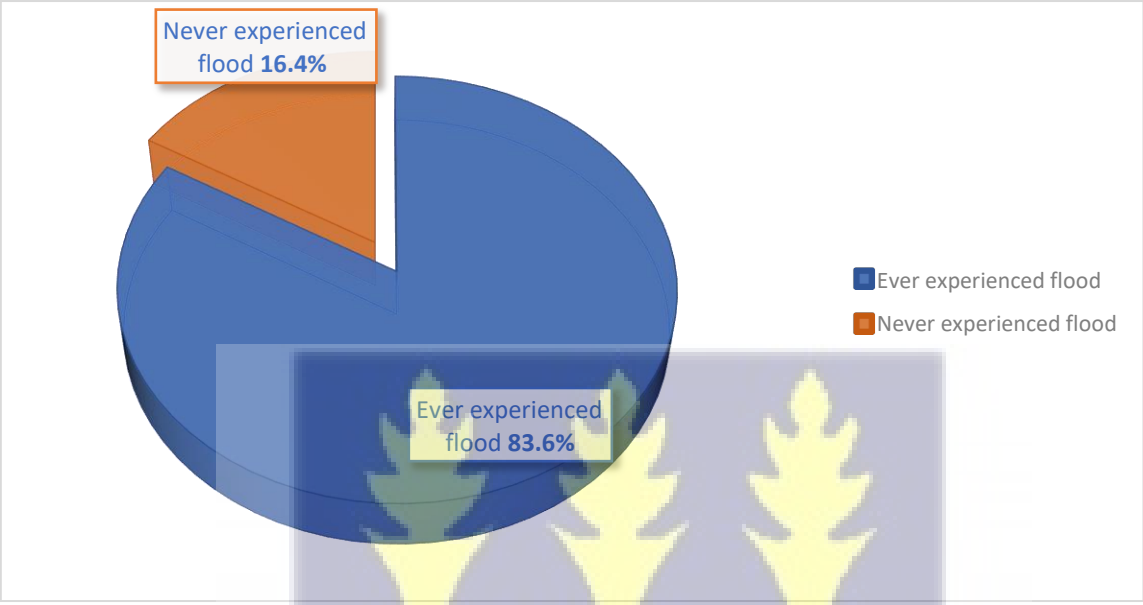
Experiencing distress during floods was mutual. Among the respondents, 75% showed signs of anxiety whilst 25% showed no signs of anxiety during floods.



Source: EHICAS Data, 2021
Fig. 4.1 Percentage distribution of experience of anxiety among respondents

4.2.2 Flood Experience of Respondents

To further explain the level of anxiety experienced during floods, knowing the number of people who have ever experienced floods is important. Among the respondents, 83.6% said they had ever experienced flood while 16.4% had never experienced flood.

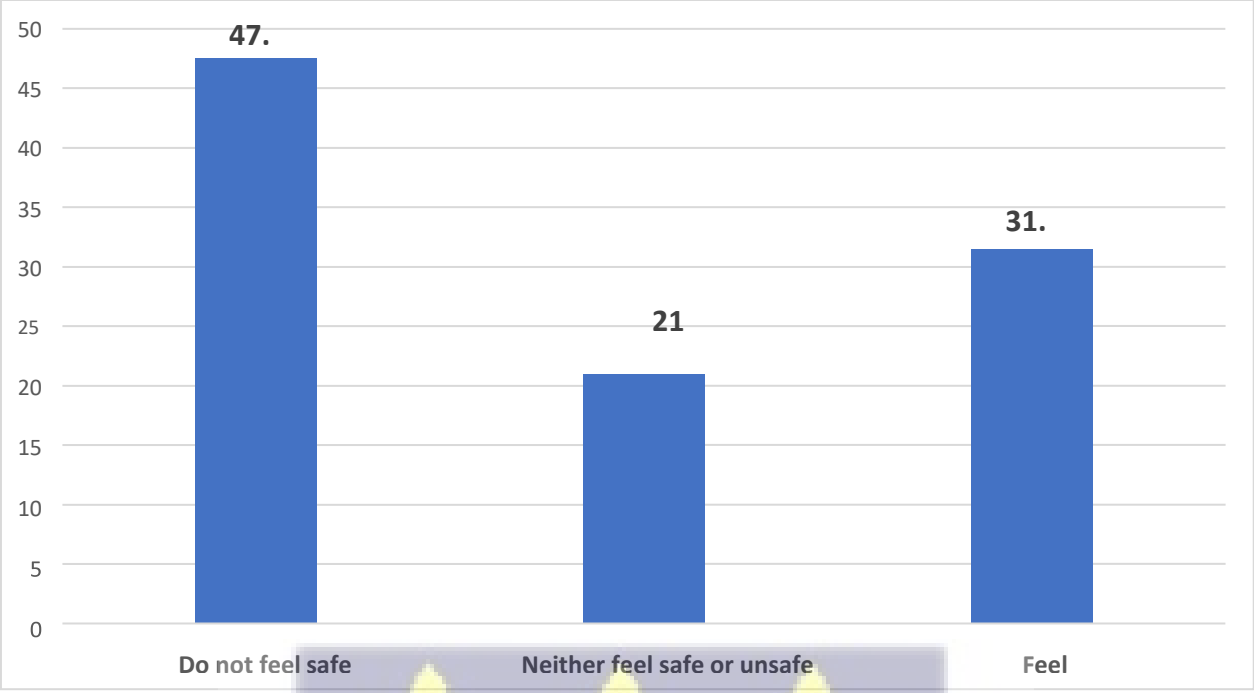


Source: EHICAS Data, 2021

Fig. 4.2 Distribution of flood experience of respondents

4.2.3 Percentage distribution of perceived safety of respondents

Figure 4.3 displays the percentage distribution of how the respondents think about their safety in their communities. About half of the respondents ascribed to not feeling safe in their community while 31.5% of them feel safe in their community. Those who were indifferent about their safety in the community only constituted 21% of the respondents.

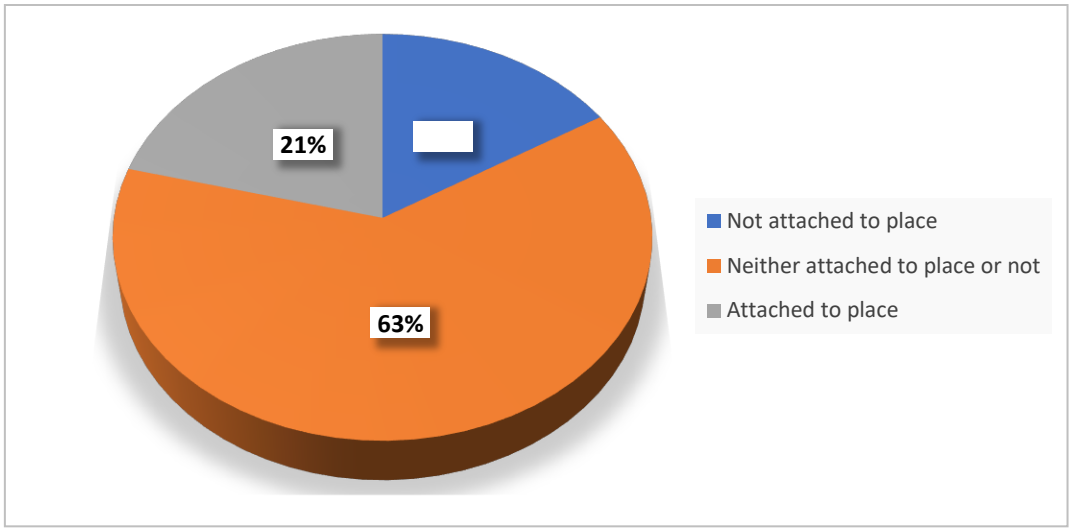


Source: EHICAS Data, 2021

Figure 4.3 A percentage distribution of how respondents perceive their safety in Totope and Keta.

4.2.4 Sense of Place Attachment of Respondents

An individual's attachment to their place of residence could stem from a myriad of reasons. Hence, relocating becomes difficult. As shown in Figure 4.4, most of the respondents (63%) are indifferent about their attachment to their communities, whiles only 21% of the respondents have some attachment to their communities.



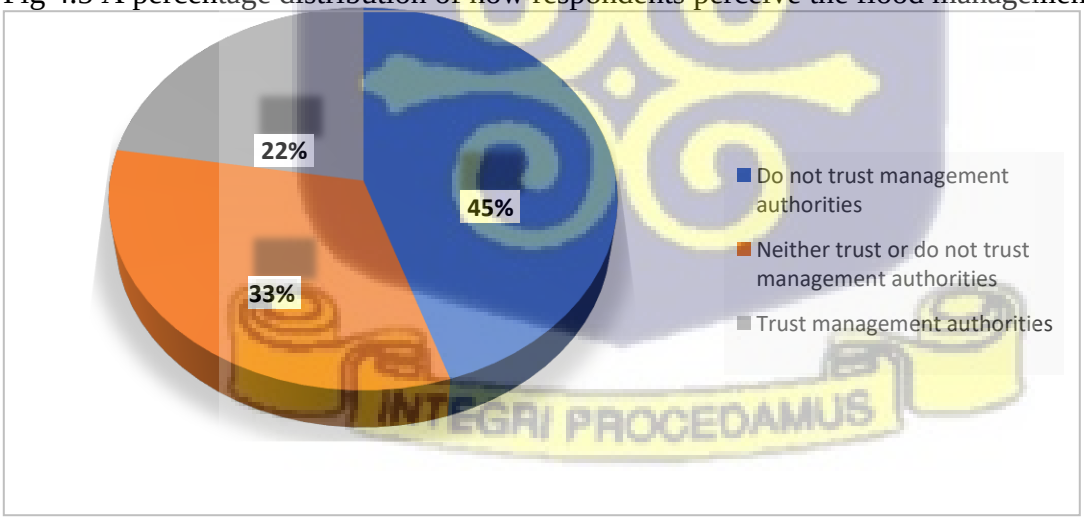
Source: EHICAS Data

Figure 4.4 Percentage distribution of the attachment of respondents to their communities

4.2.5 Perception of trust in Flood Management Authorities by Respondents

Disaster management in Ghana has often been critiqued in terms of its effectiveness and efficiency. From Figure 4.5, only 21% of the respondents trust the flood management authorities and almost half of the respondents (45%) do not trust in the flood management authorities'

Fig 4.5 A percentage distribution of how respondents perceive the flood management authorities



Source: EHICAS Data, 2021

Demographic and Socio-economic Characteristics of Respondents

4.2.6 Age of Respondents

Anxiety can affect people of all ages, from young children to the elderly. However, the causes and symptoms of anxiety can differ based on a person's age. The population interviewed for the study were adults aged 18 to 96 years. The ages of the respondents were grouped into three categories, 18 – 39 years, known as young adults, 40 – 69 years known as the middle age and 61+ years older group. The 61+ group are the most vulnerable. From Table 4.1, the young adults constitute a majority with 54.7% of the respondents, whiles the middle age group constituted 30.9% and the older group constituted 14.5% of the total respondents interviewed.

Table 4.1: Percentage distribution of respondents' age range

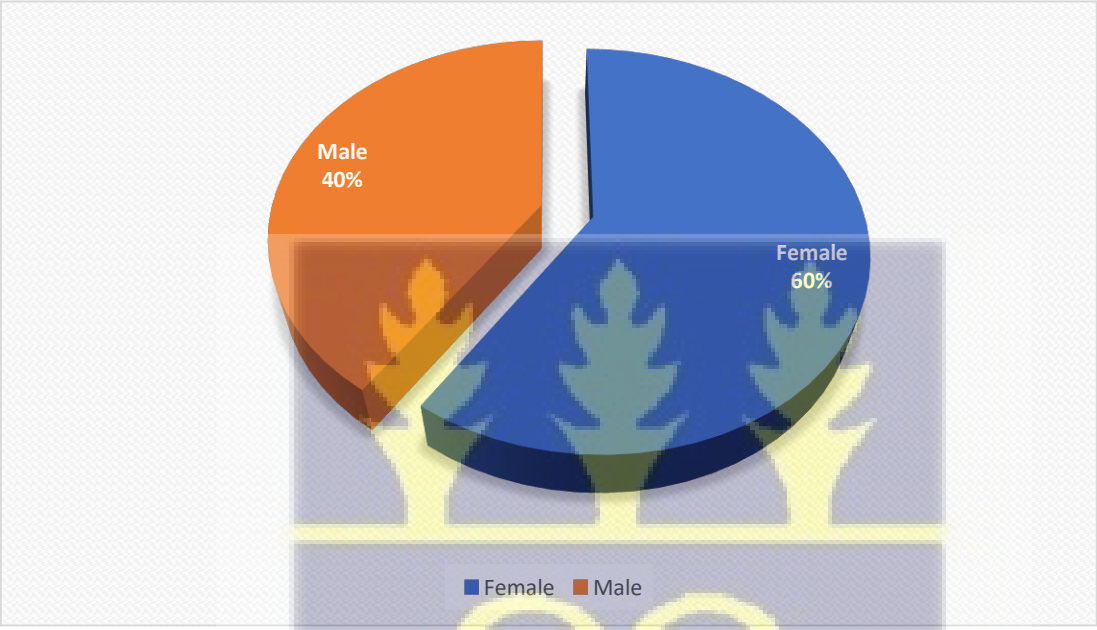
Age of respondents	**N**	**%**
Less than 20 years	29	5.7
20 – 39 years	247	48.9
40 – 59 years	148	29.3
60+ years	81	16.0
Total	505	100

Source: EHICAS Data, 2021

4.2.7 Sex of Respondents

Sex is an important variable in this study as research suggests that anxiety disorders can differ in prevalence and manifestation between males and females. From Figure 4.6, more than half of the study participants (60%) were females while the remaining 40% were males.

Figure 4.6 Percentage distribution of sex of respondents.

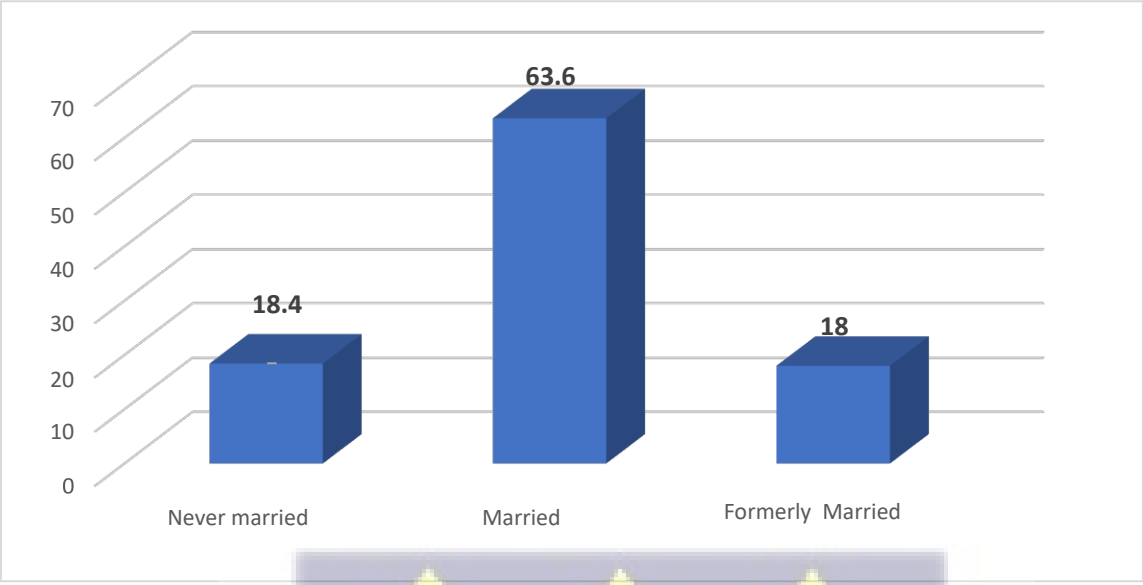


Source: EHICAS Data,2021

4.2.8 Marital Status of Respondents

Marital status can influence anxiety in different ways. Studies have shown that people who are married or in a committed relationship tend to have lower levels of anxiety compared to those who are single or divorced. This may be because having a supportive partner can provide emotional and practical support, and help to reduce stress. Figure 4.7 presents the marital status of the study population. The majority of the study participants (63.6%) were married, 18.4% were never married and the remaining 18% were previously married.

Figure 4.7 Percentage distribution of marital status of respondents.

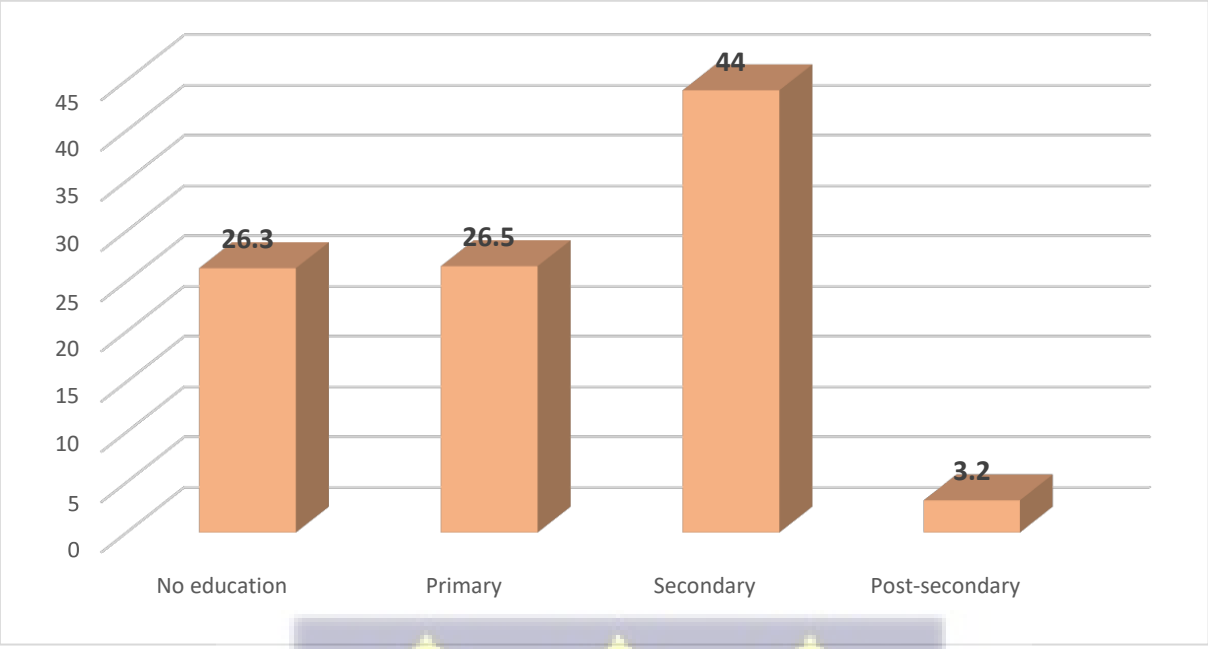


Source: EHICAS Data,2021

4.2.9 Educational Level of Respondents

Education is vital for any nation's development. An individual's level of education often translates into their perceived knowledge and beliefs about certain phenomena. Figure 4.8 shows the distribution of the level of education of the study participants. A majority (44%) had secondary education followed by 26.5% with primary education, 26.3% with no education and 3.2% with post-secondary education.

Fig. 4.8 Distribution of educational level of respondents.



Source: EHICAS Data, 2021

4.2.10 Household Tenure Type of Respondents

The household tenure type is an important variable in this study as it is closely related to socio-economic status and living conditions of the respondent, which have been shown to be associated with anxiety levels. As illustrated in Table 4.2, a good majority (47.1%) of the respondents were occupying their own home, 44.8% lived with family or friends, whilst the remaining 8.1% were living in a rented or temporal place.

Table 4.2: A table showing the percentage distribution of household tenure type of respondents

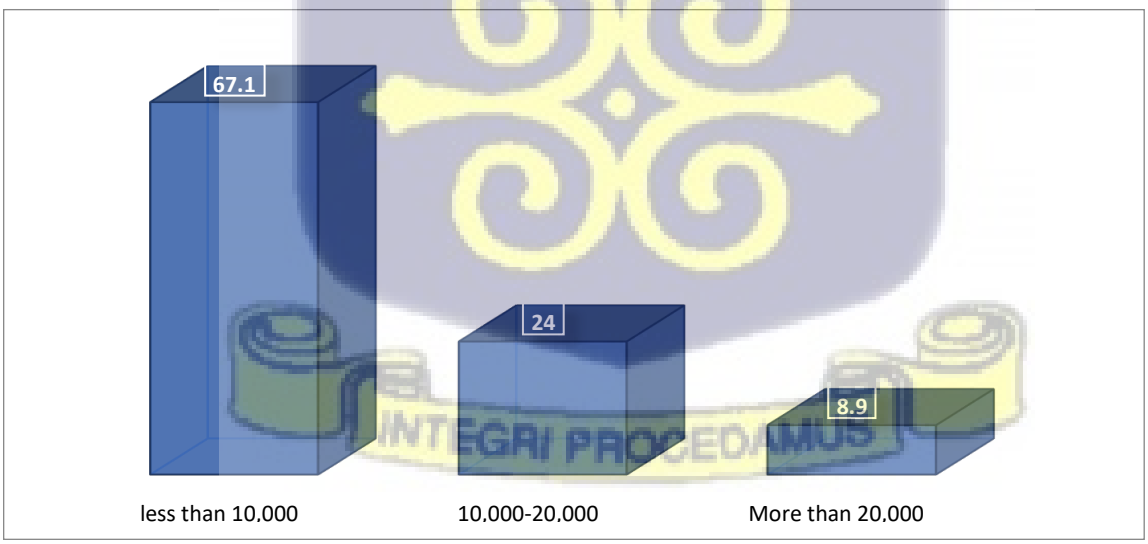
Household Tenure	**N**	**%**
Renting	41	8.1
Owner-occupier	238	47.1
Living with family/ friends	226	44.8
Total	505	100.00

Source: EHICAS Data, 2021

4.2.11 Annual Household Income of Respondents

This is closely related to the socio-economic status of the respondent and it is also been shown to be associated with anxiety levels. The annual disposable income of households was classified into three categories. From Table 4.9, a greater majority (67.1%) of the respondents belonged to households who spend less than GH₵ 10,000 annually, 24% of the households spend between GH₵ 10,000 and GH₵ 20,000 per year and finally, 8.9% spend more than GH₵ 20,000 each year.

Figure 4.9 Distribution of annual household income of respondents.

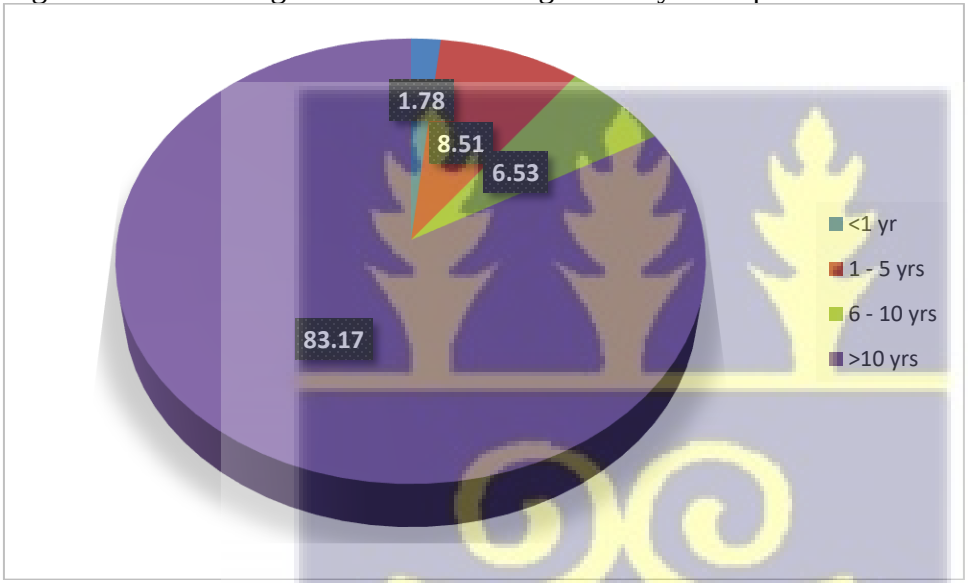


Source: EHICAS Data, 2021

4.2.12 Length of stay of respondents in the community

The number of years an individual has spent in a flood prone or a disaster hotspot community can aid in understanding certain coping measures undertaken to prevent further destruction. From Figure 4.10, a greater proportion (83%) of the respondents had stayed in the study areas for more than 10 years, 8% had been there for 1-5 years, while 7% had spent between 6-10 years in the study areas. Finally, only 2% had been resident in the communities for less than a year.

Figure 4.10 Percentage distribution of length of stay of respondents in the community



Source: EHICAS Data, 2021

4.3 Relationship between individual and household characteristics of respondent and experience of anxiety.

This section examines the relationship between the individual and household characteristics and experience of anxiety. The study used a chi-square test of independence measures at an alpha value of less than 0.05 to measure the association between the dependent and independent variables.

4.3.1 Age of respondents and experience of anxiety

Table 4.3 shows that there is a strong significant association between one's age and experience of anxiety during flood (p = 0.005). Among respondents aged 60 and above, 75.3% showed signs of anxiety. This could be due to their vulnerability at that stage. The losses they will suffer as a result of the flood event will result in them showing higher levels of anxiety. Among those aged 40-59 years, 79.7% showed signs of anxiety whilst 20.3% showed no sign of anxiety. For people aged between 20-39 years, 74.9% showed signs whilst 25.10% showed no sign of anxiety. Among the age group less than 20 years, 51.7% showed no signs of anxiety while 48.3% showed signs of anxiety. These people may still be under the supervision of their parents and may not directly feel the effect of the flood. In this study, age differences in the experience of anxiety increased after 60 years, where older people show signs of anxiety during floods.

4.3.2 Gender and experience of anxiety

From Table 4.3 there is no statistically significant association between one's gender and experience of anxiety (p = 0.162). Among the female respondents, 77.1% experienced some symptoms of anxiety whilst 22.9% did not exhibit any signs of anxiety during floods. This conforms with a study by Agyei-Mensah et al., in 2012, which saw women who had experienced floods experience symptoms of anxiety as compared to those who hadn't experienced floods. For the males, 71.6% showed signs of anxiety whereas 18.6% showed no symptoms of anxiety during floods.

4.3.3 Marital status and Experience of Anxiety

Table 4.3 shows that there is a statistically significant association (p = 0.031) between marital status and experience of anxiety during floods. Among married participants, 74.8% recounted showing signs of anxiety whilst 25.2% showed no signs of anxiety during floods.

For never married respondents, 66.7% showed signs whilst 33.3% showed no symptoms of

anxiety. Finally for formerly married respondents, 16.5% showed no symptoms of anxiety and 83.5% showed signs of anxiety during floods. Thus, these findings imply that marital status has a significant impact on experiencing anxiety during floods.

Table 4.3 Respondents' demographic variables by experience of anxiety.

	Experience of Anxiety			
	No signs of Anxiety	***Signs of Anxiety***		
	Percent (%)	**Percent (%)**	***Total***	**P-Value**
Gender				
Female	22.9	77.1	301	*0.162*
Male	28.4	71.6	204	
Total	25.1	74.9	505	
Age Range				
Less than 20 years	51.72	48.28	29	
20 – 39 years	25.10	74.9	247	
40 – 60 years	20.27	79.7	148	*0.005*
61+	24.7	75.3	81	
Total	25.1	74.9	505	
Marital status				
Never married	33.3	66.7	93	
Married	25.2	74.8	321	*0.031*
Formerly married	16.5	83.5	91	
Total	25.1	74.9	505	

Source: EHICAS Data

4.3.4 Educational level and experience of anxiety

Education provides a sense of awareness of everyday phenomena. It surges people's knowledge, their beliefs, attitudes, preventive and precautionary measures towards natural disasters. From Table 4.4, an individual's level of education is not statistically significant with experiencing anxiety during floods (p = 0.658). People with secondary education had a high proportion (76.1%) of having signs of anxiety, followed by people with no education (73.7%). Among people with primary education, 73.1% showed signs of anxiety. The highest response rate for showing signs of anxiety during floods (87.5%) was among men with higher education (post-secondary). This could stem from the fact that due to their level of education; they have in-depth knowledge of the devastation that could be caused by floods hence their concern.

Table 4.4 Respondents' socio-economic characteristics by experience of anxiety

	Experience of Anxiety			
	No signs of Anxiety	***Signs of Anxiety***		
	Percent	**Percent**	***Total***	**P-value**
Educational level				
No education	26.8	73.7	133	
Primary	24.6	75.4	134	
Secondary	23.9	76.1	222	*0.658*
Post-secondary	37.5	62.5	16	
Total	25.1	74.9	505	
Household tenure type				
Renting	31.7	68.3	41	
Owner occupier	18.9	81.1	238	*0.009*
Living with family/ friends	30.5	69.5	226	
Total	25.1	74.9	505	

Number of years lived in community				
<1yr	44.4	55.6	9	
1-5yrs	16.3	83.7	43	
6-10yrs	36.4	63.6	33	*0.121*
>10yrs	24.8	75.2	420	
Total	25.1	74.9	505	
Annual Household Income				
less than 10,000	24.5	75.5	339	
10,000-20,000	28.9	71.1	121	*0.443*
More than 20,000	20.0	80.0	45	
Total	25.1	74.9	505	
Flood experience				
Never experienced flood	41.0	59.0	83	
Ever experienced flood	22.5	77.5	422	*0.000*
Total	21.2	78.8	505	
Sense of attachment to place				
Not attached to place	15.9	84.1	82	
Neither attached to place or not	27.1	72.9	317	
Attached to place	26.4	73.6	106	*0.105*
Total	25.1	74.9	505	
Perception of flood safety				
Do not feel safe	8.3	91.7	240	
Neither feel safe or unsafe	34.0	66.0	106	
Feel safe	44.7	55.3	159	*0.000*
Total	25.1	74.9	505	
Perception of trust in flood management authorities				
Do not trust flood management authorities	20.7	79.3	240	
Neither trust or do not trust flood management authorities	28.5	71.5	106	*0.114*
Trust flood management				

authorities	29.2	70.8	159
Total	25.1	74.9	505

Source: EHICAS Data, 2021

4.3.5 Household tenure type and experience of anxiety

The type of residence one occupies is vital in this study. This aids in knowing the type of preventive measure put in place to reduce the catastrophic effects of floods. From Table 4.4, the relationship between household tenure type and experience of anxiety is significant (p = 0.009). Among those are renting, 68.3% showed signs of anxiety whilst 31.7% showed no signs of anxiety. For homeowners, 81.1% disclosed signs of anxiety while 18.9% disclosed no signs of anxiety during floods. For people living with friends/family, 69.5% disclosed signs of anxiety while 30.5% showed no signs of anxiety. Finally, all temporary residents were clearly anxious during floods.

4.3.6 Number of years in community and experience of anxiety

The number of years one has resided in a particularly flood-prone area may reveal some coping measures adopted. From Table 4.4, there is no statistically significant association between the number of years lived in the community and the experience of anxiety during floods (p = 0.121). Of the people who had lived there between 6-10 years 63.6% showed signs of anxiety. For respondents who are residents for more than 10 years, 75.2% also showed signs of anxiety whilst 24.8% showed no signs of anxiety during floods. Then for respondents who are residents for 1-5 years, 83.7% showed signs of anxiety during floods. Finally, for respondents who are less than a year in the communities, 55.6% showed signs of anxiety whilst 44.4% showed no signs of anxiety during floods.

4.3.7 Annual household income and experience of Anxiety

The absence of regular income and inadequate resources often restrains the ability to adopt precautionary measures against natural disasters in hotspot areas. From Table 4.4 above, 75.5% of respondents belonging to households who spent less than GH₵10,000 annually, showed signs of anxiety whilst 24.5% showed no signs. Among households with an annual income between GH₵ 10,000 and GH₵20,000, 71.1% exhibited signs of anxiety while 28.9% showed no signs of anxiety during floods. Then among respondents from households whose annual income was more than GH₵ 20,000, 80.0% showed signs of anxiety whilst 20.0% exhibited no symptoms of anxiety during floods. The results showed that annual household income had no significant association with the experience of anxiety during floods ($p = 0.443$).

4.3.8 Flood experience and experience of anxiety

Experiencing floods and their devastating nature over time may influence the level of distress suffered each time. From Table 4.4, there is a statistically significant association between flood experience and experiencing anxiety ($p = 0.000$). Among people who had ever experienced floods, 78.0% showed signs of anxiety while 22.0% displayed no signs of anxiety during floods. Results for respondents who had never experienced flood showed that 59.0% showed signs of anxiety while 41.0% displayed no signs of anxiety during floods.

4.3.9 Perceived safety and anxiety

The perception of safety can have a significant impact on anxiety. When a person perceives that their environment is unsafe, they may experience feelings of anxiety, fear, and distress. From Table 4.4, there is a strong statistically significant association ($p = 0.000$) between the perception of safety and feeling anxious as a result of flood experience. Most people who do not feel safe (91.7%)

showed signs of anxiety. More than half (66%) of those who are indifferent about their safety in their communities' showed signs of anxiety. Just a little over half of the people who felt safe in their communities (55.3%) showed signs of anxiety.

4.3.10 Sense of attachment to place and anxiety

Sense of place attachment refers to the emotional bond that people form with a particular place or environment. When people feel connected to a place, they are often also connected to the people in that place. This can provide a sense of community and belonging, which can help reduce feelings of isolation and anxiety. Table 4.4 does not show any significant association (p=0.105) between the attachment of people to their communities and anxiety. The table showed that amongst people who were not attached to the place, 84% of them showed signs of anxiety. For those who are indifferent about their attachment to their communities, 73% of them showed signs of anxiety and for those who have attachments to the community, 74% showed signs of being anxious as a result of the floods.

4.3.11 Trust in flood management authorities and anxiety

Trust in flood management authorities can influence anxiety related to floods in several ways. When people trust that flood management authorities are competent and capable of handling floods, they may feel less anxious about the potential impacts of floods. They may feel more confident that the authorities will take the necessary steps to mitigate the flood risk and protect their community. From table 4.4 there is no significant association (p=0.114) between the trust of people in the flood management authorities and their being anxious.

From those who do not trust the flood management authorities, 79% of them showed signs of anxiety. Amongst those who are indifferent about the flood management authorities, 72% of them showed signs of anxiety whiles those who have some trust in the flood management authorities,

about 71% of them showed signs of anxiety.

CHAPTER FIVE

RESULTS OF MULTIVARIABLE ANALYSIS

5.1 Introduction

This chapter discusses factors associated with the anxiety levels among the study population. Specifically, this chapter examines the mediating role of sense of place attachment and perceived safety in the relationship between population experience of flood and anxiety using binary logistic regression analysis. A binary logistic regression model was employed because the dependent variable is dichotomous (whether a respondent experienced some form of anxiety or not). The response code for a response with signs of anxiety response was '1' and the response code for a response with no symptoms of anxiety was '0'. In all, models were performed.

5.2.1 First Model: The relationship between flood experience and anxiety

This model examines the relationship between one's experience of flood and how it impacts their well-being with regards to anxiety. The model results are shown in Table 5.1. Model 1 shows that someone who hasn't experienced flood is 59.26% less likely to be anxious compared to someone who has experienced flood.

5.2.2 Second Model: The relationship between perceived safety and anxiety

Model 2 examines the relationship between flood experience, perceived safety, sense of place attachment and anxiety. Model 2 shows that the experience of flood is not statistically significant to the experience of anxiety when perceived safety and sense of place attachment are controlled

for in the model. The model shows a statistically significant association ($p<0.01$) between perception of safety and anxiety. The model shows that someone who neither feels safe or unsafe is 82.09% less likely to experience anxiety during a flood event as compared to someone who doesn't feel safe. Also, someone who feels safe is 88.13% less likely to feel anxious during flood events compared to someone who doesn't feel safe. Though no significant association was observed with experience of flooding, it is seen that those who have never experienced flooding are 32.41% less likely to experience anxiety unlike in the first model which was 59.2%.

Table 5.1 Regression results of flood experience and anxiety, and flood experience, perceived safety, sense of place attachment and anxiety.

	Model 1			**Model 2**		
	SE	OR	CI	SE	OR	CI
Flood experience						
Experienced flood	1	1		1	1	
Never Experienced flood	0.1027	0.4074***	0.2484-0.6682	0.1779	0.6759	0.4034 - 1.13246
Perceived Safety						
Do not feel safe				1	1	
Neither feel safe or unsafe				0.05757	0.1791***	0.09544 - 0.3363
Feel safe				0.0355	0.1187***	0.0660 - 0.21333
Sense of Place attachment						
Not attached to place				1	1	
Neither attached to place or not				0.40612	1.09761	0.53149 - 2.2667
Attached to place				0.5525	1.2622	0.53521- .97665

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.2.3 Third Model: Flood experience, socio-demographic characteristics, perceived sense of place and perceived safety, and anxiety.

Model 3 examines the relationship between flood experience, perceived safety, sense of place attachment, age, sex, marital status, level of education, household tenure, household income and anxiety. Table 5.2 shows that the flood experience statistically significant, indicating that experiencing a flood does trigger anxiety, as well as perceived safety of a place age, education, household tenure, and income are the drivers of anxiety among the study population. In Model 3, there was not so much change in the relationship between the perception of safety and anxiety in Model 2. In Model 3, someone who has not experienced flooding was 40% less likely to experience anxiety as compared to someone who has experienced flooding. An individual who felt neither safe nor unsafe in their communities was about 80% less likely to experience anxiety about those who did not feel safe. An individual who feels safe in the community is 87% less likely to experience anxiety. The model also showed that people within the age group of 20 – 39 years were about 300% more likely to experience anxiety during flood events as compared to someone who is less than 20 years old. It also shows that someone in the age group of 40 – 59 was 308 & more likely to experience anxiety as compared to someone who is less than 20 years old. In terms of education, the model showed that people who have completed Junior High School were 196% more likely to experience anxiety as compared to someone who has had no education at all. The model also showed that individuals who owned their own houses are 2 times more likely to be anxious during flood events as compared to people who are renting. Households with an income in the range of GHc 10,000 – GHc 20,000 are 37.24% less likely to experience anxiety as compared to households with an annual household income of less than GHc 10,000.

Table 5.2: Regression results of flood experience and anxiety, and flood experience, perceived safety, sense of place attachment, sex, age, level of education, and anxiety.

	Model 3		
	SE OR	CI	
Flood experience			
Experience flood		1	
Never Experienced flood	0.1915	0.60890*	0.342055 - 1.08390
Perceived Safety			
Do not feel safe		1	
Neither feel safe or unsafe	0.065948	0.196009***	0.10136 - 0.37902
Feel safe	0.04066	0.12507***	0.066136 - 0.23654
Sense of Place attachment			
Not attached to the place		1	
Neither attached to a place nor not attached	0.32156	0.81682	0.37902 - 1.76694
Attached to place	0.42104	0.92254	0.37714 - 2.25667
Perception of trust of management			
Do not trust authorities		1	
Neither trust or do not trust management authorities	0.26755	0.96026	0.55627 - 1.66867
Trust management authorities	0.36806	1.13127	0.59790 - 2.14044
Age			
Less than 20 years		1	
20 – 39 years	1.44902	2.98868**	1.15554 – 7.72988
40 - 59 years	1.70038	3.0187*4	1.00084 – 0.10512
60+	1.467923	2.39989	072367 - 7.95862
Gender			
Male		1	
Female	0.3027	1.17032	0.70493 - 1.94295
Marital Status			
Never married		1	
Married	0.35169	1.05072	0.54523 - 2.02485
Formerly married	0.74752	1.50498	0.56852 – 3.98401

Level of education			
No school		1	
Primary school	0.45105	1.3923	0.73786 - 2.62718
Junior High School (JHS/JSS)	0.7103	1.96127*	0.96442 - 3.98851
Senior High School (SHS/SSS)	0.59767	1.50452	0.69065 - 3.27746
Tertiary/Professional	0.8962	1.20431	0.28010 – 65.17804
Household tenure type			
Renting		1	
Owner occupier	1.43099	2.96871**	1.15417 – 7.636
Living with family/friends	0.69491	1.48643	0.59458 - 3.71604
Household Income			
Less than 10,000		1	
10,000-20,000	0.18189	0.65788	0.38266 - 1.13105
More than 20,000	0.40166	0.80874	0.30554 – 2.14073

Note: Standard errors are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

5.3 Discussion

A comparison between the findings of this study and those of similar studies on how perceived safety and sense of place attachment, influence the experience of anxiety by someone who has experienced a flood is presented in this section.

From the study, we see that there is a significant relationship between one's flood experience and how it affects their anxiety levels. A study found that flood survivors in Ghana experienced elevated levels of stress and anxiety in the aftermath of the disaster, with symptoms persisting for several months after the event (Adinkrah et al., 2014) and this is in line with the findings of this study. In addition to direct exposure to floods, the impact of floods on social and economic well-being may also contribute to anxiety. For example, a study of flood-affected communities in Ghana found that loss of property and

income was a significant source of stress and anxiety, particularly among women (Oppong & Agyei-Mensah, 2018). Furthermore, disruptions to social networks and community support structures may increase feelings of isolation and vulnerability, further exacerbating anxiety among flood survivors (Agyei-Mensah et al., 2012).

The study also showed that there is a significant association between people feeling safe in a community and how it plays on their anxiety. Individuals who felt safe in their community were less likely to experience anxiety. Research has shown that enhancing perceived safety can effectively reduce anxiety and promote resilience in flood-affected populations. A study by Alderman et al. (2012) found that flood victims who reported feeling safe in their homes had significantly lower levels of anxiety and post-traumatic stress disorder (PTSD) symptoms than those who did not feel safe.

An individual's attachment to a place is a combined concept of affection and sentiments, trust, behaviour and accomplishments connected to a specific place (Florek 2011). Research has shown that sense of place attachment can be a significant factor in reducing anxiety and promoting psychological well-being among individuals affected by natural disasters, including floods. A study by Hummon (1992) found that individuals with a strong sense of place attachment reported lower levels of anxiety and greater resilience in response to environmental stressors than those with a weaker sense of attachment. Similarly, a study by Bonaiuto et al. (2016) found that individuals with a strong sense of place attachment were better able to cope with the emotional and practical challenges of flooding, including anxiety, depression, and loss of personal property. But this study did not show a significant association between a sense of place attachment and anxiety. This could be due to the sample size of 505. Perhaps a higher sample size could have resulted in a significant association between the sense of place of attachment and anxiety.

The study also showed a significant association between people who own their own houses and anxiety. A study conducted in the UK discovered that householders who suffered flood damage had higher levels

of anxiety and sadness than those who did not own houses. (Whitmarsh & Poortinga, 2016).

The study also showed a significant association between people who earned between GHc 10,000 to GHc 20,000 and their experience of anxiety during flood events. These people are above the poverty line in Ghana and it was found that they are less likely to be anxious. Research has shown that persons who earn over the poverty line can still have considerable levels of anxiety connected to flooding, even if those who are poor may experience more flood-related anxiety due to their higher sensitivity to the effects of flooding. According to a US study, people who lived in flood-prone locations but had higher salaries were more likely than people with lower incomes to experience anxiety associated with floods. (Lai et al., 2018). According to the study, this was probably because those with higher salaries frequently had more expensive property at risk and may have stood to lose more money as a result of flood damage. Another study done in the UK discovered that homeowners with higher-than-average incomes were more likely to install flood barriers and buy flood insurance to protect their homes from flooding, but they still experienced significant levels of anxiety related to flooding. (Whitmarsh & Poortinga, 2016).

CHAPTER SIX
SUMMARY, CONCLUSIONS & RECOMMENDATIONS

6.1 Summary

The main aim of this study is to advance the field of science by examining how place attachment and perceived safety affect the relationship between floods and mental well-being.

The study adopted the Conservation of Resources (COR) Theory and the Social Vulnerability Theory. Based on these theories the following hypotheses were drafted; Individuals who perceived their communities as safe were less likely to experience anxiety during flood events, individuals who have a strong attachment to their community were less likely to exhibit some anxiety during flood events, and individuals who are attached to a place and feel safe there are less likely to be anxious during flood events.

The hypotheses were tested to answer the research questions posed by this study. Data was collected from 505 people in Totope and Keta by the Healthy Adaptations Project at RIPS titled Evaluating Health Impact of Climate Adaptation Strategies (EHICAS). The study interviewed adult men and women aged 18 years and above who were residents of Totope and Keta. Three levels of analysis were performed to examine the relationship between flood experience, perceived safety, place attachment, and anxiety. These include the univariate, bivariate, and multivariate levels of analysis.

At the univariate level, the ages of respondents were grouped into four categories less than 20 years, 20 – 39 years, 40 – 59 years then an older group ranging from 60+ years. The population less than 20 constituted 5.74% of the sample, whiles those between 20-39 constituted the majority with 48.9, those 40 – 59 years constituted 29.3% and the remaining were in the older group. Females constituted four-fifths of the sample size. More than half of the respondents were married (63.6%). Almost half of the respondents (44%) have had up to secondary school education. With regards to

household tenure, the majority of the respondents lived in their own homes (47.1%) and also with family or friends (44.8%). The majority of the households (67.1%) earn less than GHC 10,000.00 annually. More than 80% of the respondents have been living in their communities for more than 10 years. Over 80% of these respondents have been directly or indirectly affected by floods. Averagely more than half of the respondents feel safe in their communities and more than half are also attached to the communities. On average, more than half of the people have some level of trust in the activities of the flood management authorities in the community. Almost four-fifths of the respondents showed some signs of anxiety as a result of the flood.

At the bivariate analysis level, flood experience had a statistically significant association ($P<0.01$) with experiencing anxiety. Marital status also showed a significant association ($P<0.05$) with experiencing anxiety. Out of those who had never been married, 66.7% of them showed signs of experiencing anxiety, and the majority of those who were married (74.8%) showed signs of anxiety. Of those who were formerly married, that is widows and divorcees, 83.5% of them showed signs of anxiety. The type of household tenure type also showed a significant association ($P<0.01$) about experiencing anxiety. More than half of the respondents who rent privately (58.6%) showed signs of experiencing anxiety. More than eighty per cent of the respondent who lived in their building experienced some anxiety.

In the multivariate analysis, three models were fitted to examine the mediating effect of perceived safety and sense of place attachment on anxiety about flood experience. In the first model, the analysis was done on the experience of flood and the experience of anxiety. There was a significant association ($P < 0.01$) between the experience of flood and how it causes anxiety among the respondents. The second model examined the relationship between the independent variable which is flood experience, and the mediating variables which are perceived safety, sense of place attachment and anxiety. In this model, only perceived safety was found to have a significant

association (P < 0.01) with anxiety. The third model focused on the relationship between the independent variable which is flood experience, and the mediating variables perceived safety, sense of place attachment, the control variables and anxiety. This model also found a significant association (P < 0.01) between flood experience, perceived safety, household tenure (P < 0.05), household income (P < 0.10) and anxiety. This model showed no significant association between sense of place attachment and anxiety.

These findings support the hypotheses of the study. According to the COR theory, individuals experience stress and anxiety when they perceive a threat to their resources, and they attempt to cope with this stress by either acquiring additional resources or conserving existing resources. The Social Vulnerability theory also indicates that factors such as poverty can increase a person's susceptibility to harm. With regards to flooding, individuals may experience stress and anxiety due to the loss or damage of material and personal resources, as well as the potential for harm to themselves or their loved ones. But if they perceive they are safe in the flood-prone area, this may also reduce an individual's stress and anxiety levels.

This study has three hypotheses, the first hypothesis which states that households with higher experience of flood with show high levels of anxiety is true for the study. The second hypothesis which states that the relationship between household flood experience and anxiety can be mediated by perceived safety is also true for this study. However, the third hypothesis which states that the relationship between household flood experience and anxiety can be mediated through place attachment is rejected from the findings of the study.

6.2 Conclusion

Generally, the experience of flooding resulted in the majority of the respondents feeling anxious but the thought of feeling safe in a community reduces the probability of an individual feeling

anxious. Most of the respondents were individuals who have been staying in their communities for over ten years and also the majority of the respondents were people who owned their place of residence. These respondents after several experiences of the flood may have put some measures in place and built some resilience towards flood events over the years. The results of this study cannot be generalized to other studies in other parts of the world..

6.3 Recommendations

The study shows that how one perceives safety in a community and how attached one is to their community have some influence on anxiety levels when disaster strikes. It is there important that measures are put in place to enhance the safety of people along the Volta Delta. According to a report by the United Nations Environment Programme (UNEP), the Keta defence wall has brought relief to the community by reducing the frequency and severity of flooding in the area. More safety measures can be put in place to offer some relief to the communities along the Delta Volta.

Community engagement and education to help promote awareness of flood risks and effective response to flooding, and also involving the communities in planning and decision-making about flood management.

Some of the communities along the volta delta have Ramsar sites which are home to endangered species of birds, government developing these areas as tourist attraction sites can offer some employment opportunities to the locals, which will build a strong sense of attachment to the place. For a community like Totope, a good water system will bring some comfort to the inhabitants. While the government of Ghana provides relief items to flood victims through the National Disaster Management Organisation (NADMO), it should also put measures in place to meet the psychological needs of flood victims. Below are some measures that can be put in place to help flood victims deal with their anxiety:

1. Provide emotional support: Flood victims need emotional support and a safe environment to talk about their experiences. Providing them with counselling and therapy services can help them process their emotions and cope with the trauma. During the COVID breakout, the government of Ghana set up a team of psychologists to give counsel to Ghanaians, the government can set up a team of psychologists to offer counselling and therapy services to affected victims.

2. Establish community support groups: Creating a community support group for flood victims can provide them with a sense of belonging and support. These groups can also serve as a platform for sharing experiences and information.

3. Offer practical support: Government of Ghana or private humanitarian organisations can provide practical support such as food, shelter, and clothing to flood victims. This can help reduce the stress of their immediate needs and allow them to focus on their emotional and psychological recovery.

4. Provide education and information: Provide flood victims with education and information on how to cope with the psychological effects of the disaster. This can include tips for managing anxiety and stress, coping strategies, and resources for mental health support.

5. Involve the community: Involve the community in supporting flood victims. This can include organizing fundraising events, volunteering, or providing other forms of support.

6. Collaborate with mental health professionals: Collaborate with mental health professionals to provide specialized support to flood victims. This can include individual counselling, group therapy, and other evidence-based treatments.

7. Address long-term recovery: Recognize that psychological recovery is a long-term process and provide ongoing support to flood victims. This can include follow-up counselling,

check-ins, and other forms of support as needed

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