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Recurring Floods and Public Health in Nigeria: Historical Reflections from the Benue Valley (2012–2022)

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Abstract

The Benue Valley, located in North Central Nigeria and encompassing parts of Benue, Taraba, Kogi, and Nasarawa States, has faced increasingly devastating flooding events since 2012, exacerbated by excessive rainfall and the release of water from Cameroon's Lagdo Dam. This study examines the public health implications of recurring floods in the region using a qualitative historical methodology and multidisciplinary analysis. Findings reveal widespread damage to health infrastructure, increased breeding of disease vectors such as mosquitoes, water pollution, and outbreaks of malaria, cholera, and typhoid. The destruction of clinics and displacement of residents severely limited access to healthcare, placing strain on surviving facilities. The study recommends structural interventions, including the construction of buffer dams, river dredging, and improved drainage systems, alongside policies to relocate vulnerable populations and increase access to clean water.

Keywords: Floods in Nigeria, Public Health, Benue Valley History

INTRODUCTION

Among the many natural disasters that often plague humanity is flood; the World Health Organization classifies flood as one of the most frequent disasters. It occurs when an overflow of water submerges dry

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land [1]. According to the World Health Organization, floods are often caused by a number of conditions, such as heavy rainfall, rapid snowmelt or storm surge, or a tropical cyclone or tsunami in coastal areas [2]. The disaster of flood is accompanied by a number of impacts ranging from economic and social aspects, manifesting in the form of health challenges to displacement as a result of the flood. For instance, the World Health Organization Regional Office for Europe reports that, 'Health effects of flood events arise directly through contact with floodwaters or indirectly from damage to health facilities, infrastructure, ecosystems, food and water supplies or social support systems. They can be immediate or appear days, weeks or months after the floods have receded [3].

Before 2012, there were no major cases of flood in the Benue Valley; the area recorded just some minor annual floods. Iortyer Dominic and Yio Benjamin confirm this when they reported that, 'In the Benue Valley, the worst devastating floods took place in 2012 and 2022. Apart from the 2012 and 2022 floods, there have been other floods with damaging effects on the inhabitants of the region, but just not as severe as the two incidents mentioned above [4]. Highlighting the causes of flood, they maintain that 'the leading factors that have accounted for the recent regular occurrence of flood in the Benue Valley are excessive rainfall coupled with the release of excess water from the Lagdo Dam from Cameroon and insufficient provision of buffer dams by the Nigerian government over the years [5].

The now regular visitor, that could at best be considered a visitor of sorrow, has a wave of destruction that can only be understood by discussing these forms of destruction witnessed by the people. Of the many forms of the damaging effects of flood to man, the health aspect receives relatively little concern; more often than not, the economic and environmental damage is mostly given better attention. This low attention on the health implications of floods is actually the major inspiration that informs the choice of this study. This study has therefore examined the health impact of flood on the public health of the people of the Benue valley, to anchor this discussion in a sound manner, operational concepts would have to be properly conceptualize and contextualized, it is on this basis that; the paper presents the next segment dedicated to the task of clarification.

CONCEPTUAL CLARIFICATIONS

It is important to clarify some words considered to be cardinal in the understanding of this study. The essence is to also eliminate the chances of controversies and ambiguities especially being a study related to health and the public. Therefore, this study has committed a good energy to clarify the following concepts.

Benue valley

Studies on this geographical component of Nigeria known as the Benue Valley has revealed a changing nomenclature since the colonial times, the bottom line however is that all the descriptions and nomenclatures revolves around river Benue which is the major geographical feature within the area. Reuben Udok used the phrase, 'Benue Valley' in his bid to describe the course or direction of flow of river Benue [6], this name was given because of the unusual flow of the river which flows through the valley which is free from rapid and waterfall. This river is believed to posses this uniqueness due the fact

that, throughout its 500 miles below Yola, it flows through the sedimentary rocks [7]. It is also to the credit of this river with a unique flow course that, in it, navigation is possible on the course of this river in Nigeria except during the dry season when the sandy-beds are exposed at long intervals with some occasional rock banks thereby obstructing free navigation [8]. The British geographer, Alfred Thomas Grove as published in his 1979 volume titled, *Rural Africa,* he recognized four physiographic divisions within the basin [9]. One of these divisions was designated the Valley Floor Plains and is considered here to be the only part of the Benue basin which can properly be referred to as the Benue valley. So defined, the Benue valley covers an area of over 22,000 square miles in Nigeria, and is made up of two physiographic divisions, the river and its flood plains, and the lowland areas which lie above flood levels [10]. Subsequent political demarcations saw the divisions of this valley into states, a larger part of which falls within the central Nigeria [11].

Figure 1: Map showing the Benue River drainage Basin

Source: extracted from online
Source Link

Flood

As defined by Jed D.N., and Agrawal S.P. [12], it is 'a general temporal state of partial or fully submersed inundation from overflows of inland or tidal waters or from infrequent and rapid accumulation of runoff. The common understanding is that it is a temporary inundation that happens when surface water runoff moves on surface flows, gutters etc. it is an inundation that occurs because of excess water within a water body, which causes it to exceed drainage channel capacity and overflow its bounds [13]. The World Health Organization identifies three (3) common types of floods:

- Flash floods are caused by rapid and excessive rainfall that raises water levels quickly, and rivers, streams, channels, or roads may be overtaken.
- River floods are caused when consistent rain or snow melt forces a river to exceed its capacity [14].
- Coastal floods are caused by storm surges associated with tropical cyclones and tsunamis.

To properly categorize the Benue Valley Flood, it could be placed under flash flood, this is because it usually occurs during excessive rainfall that raises water heights quickly, and the main river Benue and all the affiliated Channels, streams, and roads are overtaken by the flood.

In further analysis of the dominance of disasters of the overall human disasters, the World Health Organization reveals that, 'between 80-90% of all documented disasters from natural hazards during the past 10 years have resulted from floods, droughts, tropical cyclones, heat waves, and severe storms. Floods are also increasing in frequency and intensity, and the frequency and intensity of extreme precipitation are expected to continue to increase due to climate change. This, therefore, means that a good commitment has to be made to study flood in all ramifications, given the fact that it poses an enormous threat to human comfort.

Public Health

It is pertinent to lay a solid foundation by first of all understanding what health is. The concept of health might be understood differently if all individuals had the opportunity to ventilate their opinions. However, in the absence of such an opportunity, the working definition provided by the World Health Organization is considered and adopted by this study. This noble health organization with a global and professional pedigree defines 'health' as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity [15]". Penka Gatseva D. & Mariana Argirova define public health as, "the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals [16]". There is a growing recognition by governments across the world, non-governmental organizations, and individuals of the relevance of public health, albeit it continued to reception of less funding as compared to medicine [17]. In another sense, going by the definition of Penka and Argirova which emphasize the role of organized efforts of informed choices of society, organizations, private and public, communities, and individuals [18], this very intellectual commitment could also be considered as a good step towards achieving a relatively safe public health in the Benue Valley. This study, however, conceives public health in a layman's understanding while relating it to the study area. It views public health as the total impact of flood-related health challenges on the people living in the Benue Valley. In this sense, the effects are examined not just on the riverine dwellers but also the upland dwellers to understand the dimension in which the flood affects them.

CAUSES OF FLOOD IN BENUE VALLEY

In early July 2012, a devastating flood visited the Benue Valley, considered by the National Emergency Management Agency of Nigeria (NEMA) as the worst in forty years. The flood killed at least 137 people. Apart from the 2012 and 2022 floods, there have been other floods with damaging effects on the

inhabiting communities of the Benue Valley, but just not as severe as the two incidents mentioned above [19]. The leading factors that have accounted for the yearly occurrence of flood in the Benue Valley are excessive rainfall coupled with the release of excess water from the Lagdo Dam in Cameroun and insufficient provision of buffer dams by the Nigeria government over the years [20]. This menace has become a recurring incidence in the Valley leading to a serious threat to the public health of the people of this valley.

Implications of Flood on Public Health in the Benue Valley

Available reports indicate that, by July, the water level in the Benue Valley started rising, and by September to October, the flood unleashed its brutal toll on the communities occupying the banks of the river [21]. The flood forced at least 1.3 million people out of their homes and claimed at least 163 lives. This is aside from the large hectares of farmland that were washed away, which was a threat to food security on its own; the flood also destroyed many feudal bridges that served as linkages to farms and some metropolitan urban centers [22]. In a Punch newspaper report dated 27th May 2013, the Director General, National Emergency Management Agency (NEMA), Alhaji Muhamed Sani-Sidi, put the estimated damage of infrastructure, physical and durable assets caused by the flood at the tune of 16bn, admitting that its effect included all sectors of human life [23]. Information released by the Taraba State Emergency Management Agency indicates that a total of 14 Clinics/Dispensaries were damaged, 4 in Ardo Kola, 3 in Gassol Local Government, 1 in Lau, 5 in Karim Lamido, 1 in Wukari [24]. Furthermore, 1 bridge was destroyed in Wukari Local government, and at least 50 culverts were destroyed, 30 in Lau Local Government, 12 in Gassol Local Government, 5 in Wukari Local Government, 4 in Ardo Kola and 6 in Karim Lamido local Governments areas, the report also indicated, 11,178 houses were washed away with over 83,722 farmlands being affected [25]. Discerning from the above analysis, one could see the massive destruction of fourteen Clinics/Dispensaries just in one state alone, the implication of that to public health is a drastic reduction in access to basic health care, the destruction of bridges, culverts homes and farmlands equally have a ripple effect that affect the public health. For instance, homeless people who had nowhere to seek refuge were squeezed in IDP camps with deteriorating conditions [26].

In the 2022 flood, the International Organization for Migration(IOM) in conjunction with Displacement Transparency Matrix (DTM) released a report which indicated that, the flood dragged at least, 50,2075 people to Internally Displaced Camps, also included in the breakdown, 35% of the affected population had no access to health care, 16% percent of the health facilities were submerged, 16% of the total affected population could only access health care by joining long queues and the remaining 16% of the healthcare was not functional completely [27].

Table 1: The effect of flood on Public Health in Taraba State, 2022

Tarab	Year	Total number displaced	Percentage of victims with no access to healthcare	Percentage of healthcare facilities submerged	Percentage of victims could access healthcare only by long queues	Percentage of health facilities completely destroyed

,,	2022	50,2075	35%	16%	16%	16%

Source: Extracted from the data provided by the International Organization for Migration and Displacement Tracking Matrix report 2022

Here, too, one could observe the obvious damning effect of the flood on the public health of the people of this area. In Nasarawa state, the November flood of 2022 submerged the only healthcare facility in Angulu community in Doma local government and many others in other local governments, a condition that led to the ferry of a 25 years old pregnant Abiye Bawa to highlands where she delivered and later invited the officials of the IDP camp at Rukubi who continued with her from there [28]. The WHO report of September 2024 shows how Mrs. Bawa lamented that she and her husband had an overcrowded house of almost 100 people because of the rain, and because of that, they are falling ill and fatigued due to starvation. She added that she is a farmer because the main occupation of her village is farming and hunting so she had no choice than to stay in the congested camp. In summary, many health facilities in Nasarawa state were damaged, the World Health Organisation Report stated that; 'In Nasarawa state, 11 out of the 13
Local Government Areas (LGAs) in the state are affected and 11 health facilities previously serving a catchment population of 17401 are either partially (4) or completely (8) flooded [29].

Significant public health threats include the spread of water- and vector-borne diseases, with outbreaks of diarrheal diseases, skin infections, respiratory tract infections, malaria, and snake bites, among others. To cushion the effect of the flood on the health of the displaced persons, the Nasarawa State government and the World Health Organization (WHO) have been providing health care in many of the displacement camps, with particular support to children, pregnant and lactating mothers [30].

In Benue state too, the report was equally damaging, according to the World Health Organization in conjunction with the Benue State Emergency Management Agency, Displacement Transparency Matrix, and the International Organisation for Migration jointly released a report indicating that; the 2022 flood affected a population of at least, 7, 092, out if this number coupled with non-affected population, all of them relied on only 42 health care facilities that survived after the flood, furthermore, 206 houses were partially damaged, 27 houses were completely damaged, 55% of the total affected population had cases of acute diarrhea and chloral related illness as a result of the flood [31]. The summary of vulnerability is described in the report thus;

> 'Diverse groups of vulnerable people were identified among the displaced population. Pregnant women (30,068 individuals), breastfeeding mothers (65,086 individuals), the elderly (49,308 individuals), and persons with chronic illnesses (3,618 individuals) require immediate and sustained access to healthcare services. These individuals face significant health risks in displacement settings, where access to healthcare services may be limited, and living conditions can exacerbate preexisting conditions. Unaccompanied children (1,625 individuals) and orphaned minors (5,866 individuals) need protection services to ensure their safety and well-being [32].

Table 2: The effect of the 2022 flood on public health

State	year	Total pop. Aff.	Total number of health facilities that survive	No. of houses partially damaged	No. of houses completely damaged	Percentage of people with acute diarrhea &chloral	Preg. Women	B/F mothers	Elderly
Benue	2022	7.092	42	206	27	55%	30,068	65,086	49,303

Source: extracted from BSEMA Report 2022.

The above analysis is just a tip of the iceberg on the far-reaching effects of the persistent flood in the Benue Valley. It is also important to re-emphasize here that the 2012 and 2022 floods are the only fatal floods experienced in the valley; however, they top charts because of their long stay. Otherwise, since 2012, floods have become part of the seasons of this valley, but for want of time and space, discussions in paper only highlighted the above-mentioned instances and data for the purpose of illustration.

Figure 2: One of the flood submerged houses in Makurdi during the 2022 flood and IDP Camp in Kogi State

Source: BSEMA Report, 2023, NEMA Report, 2023

PREVENTIVE MEASURES

Chlorination of water: What is water chlorination?

The Safe Drinking Water Foundation provides an understanding of what chlorination is, details of the foundation's explanation state that microorganisms can be found in raw water from rivers, lakes, and groundwater. While not all microorganisms are harmful to human health, there are some that may cause diseases in humans. These are called pathogens. Pathogens present in water can be transmitted through a drinking water distribution system, causing waterborne disease in those who consume it. In order to combat waterborne diseases, different disinfection methods are used to inactivate pathogens. Along with other water treatment processes such as coagulation, sedimentation, and filtration, chlorination creates water that is safe for public consumption. Chlorination is one of many methods that can be used to disinfect water [33]. This method was first used over a century ago and is still used today. It is a chemical disinfection method that uses various types of chlorine or chlorine-containing substances for the oxidation and disinfection of what will be the potable water source [34].

Ensuring the uninterrupted provision of safe drinking water is the most important preventive measure to be implemented following flooding, in order to reduce the risk of outbreaks of water-borne diseases.

- Free chlorine is the most widely and easily used, and the most affordable of the drinking water disinfectants. It is also highly effective against nearly all waterborne pathogens (except Cryptosporidium parvum oocysts and Mycobacteria species). At doses of a few mg/liter and contact times of about 30 minutes, free chlorine generally inactivates >99.99% of enteric bacteria and viruses.
- For point-of-use or household water treatment, the most practical forms of free chlorine are liquid sodium hypochlorite, solid calcium hypochlorite and bleaching powder (chloride of lime; a mixture of calcium hydroxide, calcium chloride and calcium hypochlorite).
- The amount of chlorine needed depends mainly on the concentration of organic matter in the water and has to be determined for each situation. After 30 minutes, the residual concentration of active chlorine in the water should be between 0.2-0.5 mg/l, which can be determined using a special test kit [35].

Vaccination against Hepatitis A

- The use of hepatitis A vaccines for mass immunization is not recommended.
- Vaccination of high-risk groups, such as persons involved in the management of drinking water, waste water or sewage might be considered.
- In case of an outbreak of hepatitis A, consider immunization of contacts. The use of immunoglobulins is not recommended.
- Diagnosis of acute hepatitis A is confirmed by anti-HAV IgM antibodies [36].

Malaria prevention

- Insecticides: flooding does not necessarily lead to an immediate major increase in mosquito numbers, and there may still be time to implement preventive measures such as indoor residual spraying, or the retreatment/distribution of ITNs in areas where their use is well-known. This will also affect other mosquito-borne diseases.
- Early detection: it is important to track weekly case numbers and provide laboratory-based diagnosis (perhaps only for a % of fever cases to track the slide/test positivity rate), to pick up the early stages of a malaria epidemic.
- Free medical care: with artemisinin-based combination therapy should be provided when a falciparum malaria epidemic is confirmed, and an active search for fever cases may be necessary to reduce mortality in remote areas with reduced access to health care services [37].

Health education

- Promote good hygienic practice.
- Ensure safe food preparation techniques.
- Ensure boiling or chlorination of water.
- Vital importance of early diagnosis and treatment for malaria (within 24 hours of onset of fever) [38].

SUGGESTIONS FOR HEALTH WORKERS

The World Health Organization has outlined some safety measures that this study advocated for their strict adherence by stakeholders in the health sector. This is due to the fact that the sector has a role in the provision of health advice on the clean-up process and any short and long-term risks to health from flood contaminants. Specifically, immediately after the flood, health professionals need to provide practical advice to people re-entering their homes, clean-up workers, and deployed personnel. Thereafter, they can help to track and minimize delayed long-term health outcomes such as mental health issues. As floodwater recedes, health professionals should undertake the following tasks.

First, communicate with emergency services to ensure that people do not return home before it is safe.

Second, highlight and raise awareness of likely carbon monoxide poisoning cases to all health services.

Third, release warnings and information to the general public about risks and the need for proper ventilation when using generators and dryers.

Fourth, raise awareness of remaining threats to food and water safety from contamination of supplies and surfaces by floodwaters – encourage people to maintain hygienic and sanitary precautions until the cleanup is complete.

Fifth, re-emphasize health messages after a flood event, especially:

good hand-hygiene practices

boiling or chlorination of drinking water, safe food preparation techniques ◦ seeking treatment early in case of fever

personal protection against vectors and zoonoses, vector control interventions, adapted to the local context and disease epidemiology. The safety requirements for clean-up personnel should also be reiterated.

Clean-up crews should, in general, wear full personal protective equipment, including waterproof safety boots, hard hats, goggles, and work gloves. This is particularly essential when dealing with chemical spills or sewage contamination. Earplugs should be worn if necessary.

Every worker should receive at least basic training on likely hazards in post-flood clean-up work. Cleanup workers should be vaccinated against tetanus if their vaccination status is not up to date. Even minor wounds, burns, cuts, and injuries should be treated immediately. Floods can have a strong effect on mental health. Mental distress is most common but is usually temporary, and most people overcome it by themselves in a reasonable time [39].

SUGGESTIONS ON MITIGATING FLOOD IN THE BENUE VALLEY

Climate change has come to stay and it has been mentioned severally by different experts as one of the causes of flood so, there may be little anyone could do to alter the course of nature; however, a number of measures could be taken to ameliorate the enormous effect of flood in Nigeria and the Benue Valley. Some of these measures includes;

First, the construction of buffer dams in the Benue Valley. Big buffer dams could be constructed, for example, in Benue, Taraba, or Nasarawa. This could help in arresting the large amount of water that often descends from the Lagdo dam down to the Benue Valley, leading to loss of lives and threatening the survival of the living.

Second, the various state governments should embark on aggressive construction of large drainage channels that would guarantee free movement of water, especially in the metropolitan centers within the valley. This will go a long way in reducing the amount of water that gets tucked in residential homes and public spaces like schools and health care institutions.

Third, people sitting on the banks of the river must relocate to spare themselves from the merciless hands of the flood that has become an annual or routine experience within the Benue valley.

Fourth, whether private or public health institutions must be built on elevated points. This will reduce the condition in which health institutions, which are apparently rescue institutions, become the first victim and inaccessible places when it's time to function in a rescue manner.

Fifth, the public must desist from careless habits of indiscriminate dumping of refuse on water channels, which will enhance the free movement of water.

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