

Prevalence of Diseases in Internally Displaced Persons Camps during Climate Change (Flooding) in a Low-Income Setting

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Abstract

Objectives: To determine the common diseases in the Internally Displaced Persons (IDPs) camps during the flooding.

Methods: The study was conducted in IDP camps in Anambra State, south-east Nigeria during the last quarter of 2022 (October to December 2022). Secondary data obtained from patients' record booklets was used. A total number of 19,080 people were in the camps. The researchers went through the patients' records in various IDP camps to collect data on different diseases diagnosed. The primary outcome measure was the prevalence of the disease. Descriptive statistics are presented as means and standard deviations for continuous variables and numbers and percentages for categorical variables.

Result: Common cases managed in the camp included malaria, gastroenteritis, respiratory tract infection, enteric fever, diarrhea, arthritis, hypertension, diabetes mellitus, and trauma. The three most prevalent diseases are malaria, respiratory tract infection, and hypertension. There were also significant cases of diarrhea-like illnesses. There was a total of 419 visibly pregnant women in the various IDP camps and a total of 8 deliveries (including a cesarean section). There were more women of reproductive ages and under-fives in the camp. A total number of 2027 cases were managed in the camps, these cases were more in under-fives. The mobile clinics had links with health facilities around the IDP camps. This helped in the prevention of under-five mortality and management of severe illnesses.

Conclusion: The findings of this study revealed that the residents of IDP camps are exposed to vector-borne diseases and infectious diseases. The study revealed that there are no permanent camps and a lack of inadequate Long-Lasting Insecticidal Nets (LLINs) in the camps which can be used to reduce the prevalence of vector-borne diseases in camps. Efforts of government, philanthropists, non-governmental organizations, donors, and individuals should be geared towards providing permanent camps, adequate LLINs, health personnel, and logistics in camps.

Keywords: Climate change; Flooding; Internally displaced persons; Vector-borne diseases; Diarrhea.

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Introduction

Worldwide, flooding is thought to be the most destructive natural disaster [1]. Flooding is defined as the movement of a body of water over and above a typically submerged area of land [2]. "The rate of flood occurrence in recent times has been unprecedented," according to Peduzzi et al. and Yanmeer et al., "with over 800 million people living in flood-prone areas and 70 million people globally exposed to flooding every year [3,4]. "Up to 1.47 billion people, or 19% of the world population, are directly exposed to substantial risks during 1-in-100-year flood events, according to Rentschler and Salhab's estimation [5].

Flooding in developing nations is caused by a variety of factors, including unchecked rapid population growth, inadequate preparedness, lack of political will, excessive precipitation, building on waterways, sea level rise, soil moisture regime, and dam operations, particularly along borders [6]. There are anthropogenic and natural causes of flooding [7]. According to MacLeod et al. and Ekwebene et al., flooding is mostly caused by an increase in precipitation, which is a result of climate change [8,9]. In contrast to maximum precipitation, Trambly et al. associate flood occurrence with the maximum amount of soil moisture [10].

Flooding is a typical environmental issue in coastal areas of Anambra State. Not only can floods have a significant influence on the environment, but they also pose a serious risk to riverine communities in the State and negatively affect the health of those who live in flood-prone areas. Among the states that experienced significant floods in the final quarter of 2022 (October to December 2022) was Anambra. As a result, many were displaced from their homes, farmlands were destroyed, and lives were lost. The flood affected ten Local Government Areas (LGAs) in the state, with two LGAs entirely inundated.

During the 2022 flooding, the Anambra State Government through the Anambra State Ministry of Health set up nine Internally Displaced Persons (IDPs) Camp. During such climate change, a large number of persons were displaced [11]. In the various camps, camp clinics were set up and health workers were deployed to these clinics. This study aims to find out the common diseases in the IDP camps during the flooding.

Materials and methods

Study setting

This study was conducted in the IDP camps in Anambra state, one of the five southeastern states in Nigeria. The state is surrounded by five states (Delta, Imo, Rivers, Enugu, and Kogi). The major urban areas in the state are Awka, Onitsha, and Nnewi. Anambra has two indigenous ethnic groups (Igbo and Igala) with the Igbos making up 98% of the population and the Igala 2% of the population [12]. It has a landmass area of 4,844 km², with coordinates between Latitude 6^o 20'N and Longitude 7^o 00'E. Anambra boasts vegetation reminiscent of a tropical rainforest, a humid climate with an average temperature of approximately 30°C, and 152-203 cm of rainfall annually [13].

Study design: This study used secondary data obtained from patients' record booklets used by the healthcare workers in various camps.

Inclusion and exclusion criteria: For this study, we selected all participants seen during the IDP camps during the study period, from October 1, 2022 to December 31, 2022. For our main analysis, we excluded participants diagnosed in the camps out-

side the study period.

Outcome measures: The main outcome was prevalence of malaria, respiratory tract infection, and hypertension. Secondary outcomes were rates of other diagnoses seen in the camp.

Sample size and sampling technique: The nine IDP camps have a total number of nineteen thousand and eighty (19,080) persons. A typical case sampling method was used. The researcher went through the patients' records in various IDP camps to collect data on various diseases that were reported and treated.

Ethical consideration: Ethical approval was obtained from the Anambra State Ministry of Health Research Ethics Committee, Awka with identification number of (AS-MOHREC/2023/27072023/06). This intervention falls within the definition of public health disease surveillance (in emergency response); nevertheless, approval was also obtained from the Directorate of Planning Research and Statistics of the Anambra State Ministry of Health Awka. None of the patients' identity was revealed at any cause.

Statistical analyses: We reported on prevalence and rates of the diagnoses descriptively. Data were analyzed using SPSS software version 23 (IBM Corp). Descriptive statistics are presented as means and standard deviations for continuous variables and numbers and percentages for categorical variables.

Results

In total, 19,080 records of participants were available in the IDP camp database. The data from the various IDP camps showed that only 29 percent of persons displaced by flood went to the IDP camp provided by the government. These camps were make-shift camps. Anambra East LGA has a total of four camps, the camp consists of people displaced from some parts of Anambra East, some part of Anambra West, and some part of Ayamelum LGAs. Figure 1 shows that most of the displaced persons were in Anambra East IDP camps. Ayamelum LGA has three camps while Onitsha North and Ogbaru LGAs have just one camp.

In Table 1 below, it could be elucidated that there are a great number of children in the camps. In some camps, more than 50% of the people are children. For example, Umuerum camp in Ayamelum LGA had only 93 persons in the camp but 70 of them were children while the remaining 23 were pregnant women. There were also 417 pregnant women in the camp with Father Joseph Camp Aguleri having the highest proportion of pregnant women.

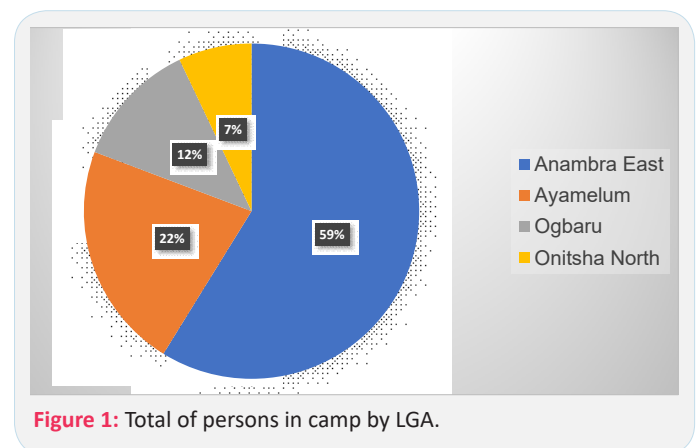


Figure 1: Total of persons in camp by LGA.

Table 1: Demographics of persons in the IDP camps.

S/N	Name of IDP camp	LGA of camp	Total number of households	Number of pregnant women	Number of children	Total number of persons in the camp
1	Father Joseph Aguleri IDP Camp	Anambra East	1691	163	1692	4452
2	Hon Onyema IDP Ogbaru	Ogbaru	676	36	1300	2326
3	Unity Primary School Umuoba Anam	Anambra East	879	42	972	3427
4	Umundenze Primary School Camp	Anambra East	250	47	380	959
5	Otaku Migrant School, Omor	Ayamelum		40	539	1068
6	Umuerum IDP Camp	Ayamelum		23	70	93
7	Igbaukwu IDP Camp	Ayamelum		35	1590	3026
8	CDC Camp Umueri	Anambra East	573	26	1020	2381
9	Bishop Crowther Memorial School Onitsha	Onitsha North	185	7	361	1348
	Total			419	7,924	19,080

Table 2: Different diseases managed in camp.

Diseases Managed	Ayamelum	Onitsha North	Ogbaru	Anambra East	Total
Arthritis		11	16	126	153
Diarrhoea		55	12	43	110
Diabetes Melitus	1	1	9	12	23
Gastritis	3	27	52	23	105
Hypertension	8	3	97	108	216
Malaria	43	267	253	190	753
Malaria in Pregnancy		5	1	6	12
Peptic Ulcer Disease	5	17	8	35	65
Respiratory Tract Infection		124	113	130	367
Trauma (injury)		43	3	5	51
Typhoid Fever		154	4	14	172
Total	60	707	568	692	2027

In Table 2 above, it is noted that there are several diseases managed in the various IDP camps but the most common disease in camp is Malaria. It was diagnosed in all the four camps. This could be attributed to the fact that they live in riverine areas with a lot of swampy waters that breed mosquitoes. Also, there were no adequate mosquito nets provided in the camps. The majority of households do not sleep under Long-Lasting Insecticide Nets (LLIN) as a result of their unavailability.

Furthermore, respiratory tract infections were another most common disease in the camps. Although this disease was not diagnosed in Ayamelum local government area, in Nigeria, it is the second most prevalent disease diagnosed in the camps. The third most prevalent disease in camp is Hypertension.

Discussion

The motivation for this study was that floods are a common environmental problem in coastal areas of Anambra State. The occurrence of flood represents a major risk to riverine communities in the State, in addition to causing substantial impacts on the environment; it also has a negative impact on the health of the people living in flood-prone areas. This study assessed the prevalence of diseases in various IDPs in Anambra during the 2022 flooding. The principal findings from this study revealed an alarming incidence of infectious diseases such as malaria, respiratory tract infections, and diarrhea among the residents

of the IDP camps. The most prevalent health condition is malaria as mentioned earlier may have been heightened by the lack of insufficient long-lasting insecticide-treated nets. These LLINs would have provided covering from mosquito bites, especially at night. This finding is in line with the study of Faronbi et al. [14]. They investigated the health needs and health-seeking behavior of internally displaced persons in Dalori Camp, Maiduguri in Borno State Nigeria. In their findings, 97.7% of the respondents in the Dalori camp had malaria [14]. Cantor et al., in their finding also concur that there is a high prevalence of malaria in IDP Camps [15]. While Charchuk et al., observed a high prevalence in under-five children in IDP Camp [16]. Moreover, several other authors have also supported the assertion that malaria is the highest-ranking health problem in IDP camps across Africa [17,18].

Respiratory Tract Infection (RTI) is the second most prevalent disease treated in the IDP camp. This could be attributed to the temperate climate conditions, environmental conditions, and changes in human behavior. Roberts et al., noted fever/malaria (48%), respiratory problems (45%), and diarrhea (22%) as the three main physical health conditions reported among the IDPs [19]. Furthermore, Olwedo et al., in their study stated that the most prevalent diseases among children in IDP camps were fever/malaria (84.4%), cough (81.7%) which is a respiratory tract infection, and diarrhea (61.9%) [20]. These studies support the findings in the study although there was a higher number of cases of hypertension than diarrhea in the IDP camp, diarrhea also has a significant number of cases reported.

The well-being of the impacted populations and public health are significantly impacted by internal displacement [17]. These effects might be classified as indirect, such as higher incidence of infectious diseases and malnutrition, or direct, like violence and injury [21,22]. During displacement, several risk factors that encourage communicable diseases combine to cause harm. The Sphere Handbook lists these causes as mass migration, temporary relocation, and resettlement, overcrowding, poverty, economic and environmental degradation, inadequate access to safe water, inadequate sanitation, and improper waste management [23]. According to Connolly et al., diarrheal infections are a leading cause of morbidity and death among Internally Displaced People (IDPs) and are mostly brought on by inadequate or subpar sanitation facilities, poor hygiene, and an inadequate supply of soap [24]. The disruption of public health services also makes it more difficult to implement prevention

and control initiatives, which in turn fuels the spread of vector-borne illnesses like yellow fever and malaria [24].

Additionally, internally displaced people have a negative attitude towards using the temporary camps that the government provides. Only 29% of the displaced people were in the camps, meaning that 71% of them could not be identified. There are several potential causes for this, including the absence of permanent camps in the state, public mistrust of the government, poor camp logistics, a shortage of medical staff, or other personal reasons, etc.

Our study has a number of clinical and global implications. Floods brought on by climate change and increased rainfall can produce stagnant water, which is ideal for the growth of water-borne illnesses including cholera, typhoid, and malaria [23,24]. Variations in temperature and precipitation cause vectors like ticks, snails, and mosquitoes to move and alter their cycles of transmission. In order to avoid and mitigate future outbreaks, allocate resources to the areas most affected, and establish international collaborations to handle the shifting burden and exchange information, it is imperative to comprehend the impact of climate change on infectious diseases. In order to lessen the worst effects, quick climate action might also be sparked by this understanding in this current report. There is a growing need and urgency for publishing on this subject. A wider geographic range of disease vectors and a higher risk of disease transmission to new populations are being created by rising temperatures, altered rainfall patterns, and disturbances to ecosystems. It is critical that we, as scholars studying global health, understand the connections between illnesses' development, resurgence, and growth in relation to climate change [23,24].

A strength of this study is the existence of nearly complete IDP camp registry database of all persons seen in the camps. Second, we differentiated different diagnosis in the various 4 IDP camps, and assessed different diagnosis over time. We chose to exclude all persons seen outside the flooding period, to make a fair comparison with other studies. Although data from the emergency flooding are less reliable due to the inclusion of any diagnosed cases, we believe that our analysis in this group provides insight in problems associated with IDP.

A limitation of the IDP camp registry is the lack of (high quality) information on clinical diagnosis Smoking rates in these important risk groups could not be provided. Furthermore, hypertensive disorders and diabetes (all types) are known to be underreported in the IDP camp registry. This is also demonstrated by the varying rates in our cohort. The increase in malaria, respiratory tract infection, and hypertension cases, in particular, warrants our full attention. Apparently our current interventions are not able to prevent these major cases. Further research is necessary to better understand the many causes of cases diagnosed.

Conclusion

The findings of this study revealed that the residents of IDP camps are exposed to vector-borne diseases and infectious diseases. Factors such as lack of/inadequate LLINs, unhygienic environment, and poor water supply contribute to the poor health status of internally displaced persons. It is therefore recommended that efforts from all quarters including government, philanthropists, non-governmental organizations, donor agencies, and individuals should be channeled towards providing permanent camps, adequate LLINs, reinforcing hygienic

practices in camps, provision of adequate health personnel and logistics in camps as well as providing insurance policies for the responders.

Declarations

Conflict of interest statement: The authors report no conflicts of interest concerning this work.

Funding statement: This work was self-funded by the Researchers.

Ethical statement: Ethical approval was obtained from the Anambra State Ministry of Health Research Ethics Committee, Awka with identification number of (AS-MOHREC/2023/27072023/06). Permission letters were granted from the State Ministry of Health prior to the study. This study was conducted in accordance with the Declaration of Helsinki.

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References

- Komolafe AA, Adegboyega SA, Akinluyi FO. A review of flood risk analysis in Nigeria. *American Journal of Environmental Sciences*. 2015; 11(3): 157-166. doi: 10.3844/ajessp.2015.157.166.
- Agbonkhese O, Agbonkhese EG, Aka EO, Joe-Abaya J, Ocholi M, et al. Flood Menace in Nigeria: Impacts, Remedial and Management Strategies. *Civil and Environmental Research* www.iiste.org ISSN 2224-5790 (Paper) ISSN 2225-0514. 2014; 6(4): 32-40.
- Peduzzi P, Dao H, Herold C, Mouton F. Assessing global exposure and vulnerability towards natural hazards: The Disaster Risk Index. *Natural Hazards and Earth System Sciences*. 2009; 9(4): 1149-1159. doi: 10.5194/nhess-9-1149-2009.
- Yanmeer ST, Ekwebene OC. Malaria in gravid women attending antenatal clinics in Atani, Ogaru local government area, Anambra state Nigeria. *International Journal of Mosquito Research*. 2021; 8(1): 118-122.
- Rentschler J, Salhab M. People in harm's way: Flood exposure and poverty in 189 countries (Washington: World Bank). 2020. https://www.ucl.ac.uk/bar_tlett/casa/publications/2021/feb/casa-working-paper-224-people-harms-way-flooding-exposure-and-poverty-189.
- Umar N, Gray A. Flooding in Nigeria: A review of its occurrence and impacts and approaches to modelling flood data. *International Journal of Environmental Studies*. 2022. <https://doi.org/10.1080/00207233.2022.2081471>.
- Abolade O, Muili AB, Ikotun SA. Impacts of flood disaster in Agege local government area Lagos, Nigeria. *International Journal of Development and Sustainability*. 2013; 2(4): 2354-2367.
- MacLeod DA, Dankers R, Graham R, Guigma K, Jenkins L, et al. Drivers and sub seasonal predictability of heavy rainfall in equatorial East Africa and relationship with flood risk. *Journal*

- of Hydrometeorology. 2021; 22(4): 887-903. doi: 10.1175/JHM-D-20-0211.1.
9. Ekwebene OC, Obidile VC, Nnamani CP, Eleje GU, Ekwebene CF. Pre and post flooding malaria parasitemia in gravid women, South East, Nigeria. *J Clin Images Med Case Rep*. 2021; 2(5): 1368.
 10. Trambly Y, Villarini G, El Khalki EM, Gründemann G, Hughes D. Evaluation of the drivers responsible for flooding in Africa. *Water Resources Research*. 2021; 57(6): e2021WR029595. doi: 10.1029/2021WR029595
 11. National Emergency Management Agency. 2022.
 12. www.anambrastate.gov.ng/history/, 2020.
 13. Brief History of Anambra State. 2023. <https://anambrastate.gov.ng/history/>.
 14. Faronbi JO, Akinyoola OD, Faronbi GO, Adegbola GA, Bello CB. Health needs and health seeking behaviour of Internally Displaced Persons in Dalori camp, Maiduguri, Borno State, Nigeria. *Res. J. of Health Science*. 2019; 7(3): 246-255.
 15. Cantor D, Swartz J, Roberts B, Abbara A, Ager A, et al. Understanding the health needs of internally displaced persons: A scoping review. *Journal of Migration and Health*. 2021; 4: 1-8. <https://doi.org/10.1016/j.jmh.2021.100071>.
 16. Charchuk R, Paul MK, Claude KM, Houston S, Hawkes MT. Burden of malaria is higher among children in an internal displacement camp compared to a neighbouring village in the Democratic Republic of the Congo. *Malar. J*. 2016; 15(1): 431.
 17. Roberts B, Ocaka KF, Browne J, Oyok T, Sondorp E. Factors associated with the health status of internally displaced persons in northern Uganda. *Journal of Epidemiology & Community Health*. 2009; 63(3): 227-32.
 18. Owoaje ET, Uchendu OC, Ajayi TO, Cadmus EO. A review of the health problems of the internally displaced persons in Africa. *Nigerian postgraduate medical journal*. 2016; 23(4): 161.
 19. Roberts B, Odong VN, Browne J, Ocaka KF, Geissler W, et al. An exploration of social determinants of health amongst internally displaced persons in Northern Uganda. *Confl Health*. 2009; 3: 10.
 20. Olwedo MA, Mworozzi E, Bachou H, Orach CG. Factors associated with malnutrition among children in internally displaced person's camps, Northern Uganda. *Afr Health Sci*. 2008; 8: 244-52.
 21. Lam E, McCarthy A, Brennan M. Vaccine-preventable diseases in humanitarian emergencies among refugee and internally-displaced populations. *Hum Vaccin Immunother*. 2015; 11: 2627-36.
 22. Guerrier G, Zounoun M, Delarosa O, Defourny I, Lacharite M, et al. Malnutrition and mortality patterns among internally displaced and non-displaced population living in a camp, a village or a town in Eastern Chad. 2009; 4: e8077.
 23. The Sphere Handbook. Minimum standards in health action. In: The Sphere Project: Humanitarian Charter and Minimum Standards in Disaster Response. 2011; 287-354. <http://www.sphere-handbook.org/>.
 24. Connolly MA, Gayer M, Ryan MJ, Salama P, Spiegel P, et al. Communicable diseases in complex emergencies: Impact and challenges. *Lancet*. 2004; 364: 1974-83.