Original Research Article

The Morbidities Experienced During and After the 2017 Flood in Port Harcourt

ABSTRACT

Background: Floods are a type of natural phenomena, identified as the world most common natural disaster with a major ravaging impact claiming lives, causing property damage, destruction of environment and infrastructure, and increasing health impacts. Port Harcourt Metropolis, the capital of Rivers State was greatly affected by the 2017 flood. Hence this study aims to determine the morbidities experienced during and after the 2017 flood.

Materials and Methods: The study was a combination of quantitative and qualitative research for effective triangulation. A cross-sectional study was carried out. Data were collected through self-administered semi-structured questionnaires and key informant interviews. Data was analysed using Microsoft excel for editing, SPSS version 20 for quantitative analysis and Nvivo version 12.0 was used for qualitative analysis.

Results: A total of 210 respondents were administered questionnaires but had response rate of 96.67% and a total of 3 key informants were interviewed with a 100% response rate. Amongst these respondents were 44.8% male and 55.2% female, with respondents' mean age of 35.96±11.15. The frequencies of occurrence of morbidities~~y experiences~~ of the residents and the 2017 flood were analyzed using percentage and chi-square test and the result showed a statistical significance ($p < 0.05$) between both variables.

Conclusion: The findings showed that the morbidities experienced during the flood had higher prevalence than post flood morbidities, but an exception was dark urine. These flood risks and morbidity outcomes can however be controlled through adequate preventive measures and recommendable interventions.

Keywords:

Floods, morbidities, experiences and health.

INTRODUCTION

Floods stand as the generally known and critical catastrophic event occurring in most global countries [1], which have resulted in loss of human life and sources of livelihood, prolonged health impact, damage and deterioration of the environment, as well as retardation to development and economic losses [2, 3]. Flooding is the most frequent global natural hazard, in terms of occurrence, with incidence and impact on the increase worldwide with a trend that is set to continue to increase in frequency and intensity due to climate change accompanied by rising sea levels and more frequent and extreme precipitation [4, 5].

The Centre for Research on the Epidemiology of Disasters (CRED) has defined flooding as "a significant rise of water level in a stream, lake, reservoir or coastal region" [6]. ~~Though floods are of mainly three types (flash flood, river flood and coastal flood),~~ their occurrence are influenced by natural phenomena and human involvement as the events and factors that precipitate flood events are diverse, multifaceted, and interrelated. Some of the factors ~~as~~are attributed to the ~~W~~weather conditions include; heavy or sustained precipitation, snowmelts, or storm surges from cyclones while some of the important human factors include structural failures of dams, alteration of absorptive land cover with impervious surfaces and inadequate drainage systems.

In tropical regions, such as the Asia and the Pacific regions, flooding of high magnitude that has resulted in serious consequences has been caused by heavy rainstorms, hurricanes, snow melt and dam failures. The United

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Kingdom National Risk Register of Civil Emergencies [7] puts the winter season of 2015/2016 as the second wettest winter on record as a series of storms (including 'Desmond' and 'Eva') resulted in heavy and sustained rainfall which resulted in flooding of about 17,600 UK properties and an estimated £1.6 billion Economic damage. In Nigeria, the incident of floods is becoming a reoccurring decimal in most rural and urban areas leading to colossal loss of properties and lives [8]. This could be said to be evident in the two days of heavy down pour of rainfall in August 2008 in Benue state threw the residents of Makurdi out of their residences and their farmlands [7]. Also, the 2012 rainy season between August and September, has been the worst than earlier years as it led to serious floods which inundated most part of the country [3]. By September 29 of the same year, the floods became so drastic that it affected over 134,371 people, displaced 64,473, injured 202 and killed 148; hence it was declared a national disaster. By the end of October, more than 7.7 million people had been affected by the floods, and more than 2.1 registered as Internally Displaced People (IDP). About 363 people were reported dead; almost 600,000 houses had been damaged, submerged or destroyed. Out of Nigeria's 36 states, 30 were affected by the floods [3]. The states affected with this bitter experience were those located within the Mangrove and Fresh water belts such as Rivers, Lagos, Delta, and Bayelsa [3,7]. In Port-Harcourt, which is the capital of Rivers State, the depth of flood ~~water~~ in affected areas has escalated significantly in the ~~past~~ previous years due to the combined effects of uncoordinated, uncontrolled rapid urbanization, development of swamps, flood plains and poor drainage channels [8].

Port Harcourt Metropolis, which like most urban areas of the third world, has in most times experienced accelerated population growth that has led to changes in the land use activities. The city is faced with a number of environmental challenges, among which ~~and among one of such challenges~~ is flooding. Floods are major natural events that may not only lead to immediate loss of life and property but may have caused physical disability and severe psychological trauma among survivors. As a result of fears and actions taken to protect family or belongings, experience of flooding and long-term uncertainties around insurance [9-11], often result in reduction in quality of life [12,13]. The IPCC in 2001 stated that the consequence of persistent rise in sea level and altered patterns of precipitation as a result of climate change are expected to increase the frequency and intensity of floods in many regions of the world. This also agrees with the assertion of Parker et al. [14], who stated that the incidence of flood disasters is growing globally as a result of various factors such as; population growth in areas at risk of flooding, climate change (which increases the variability and severity of weather, such as record-breaking rainfall and possibly more severe tropical cyclones) as well as changes to catchments (such as deforestation or urbanisation) that lead to increased run-off [15]. This thereby increases the impact of flood on health of the populace.

In the first study of one year follow-up on flood participants which was spear headed by Waite and colleagues in 2015, they reported a high prevalence of possible mental-morbidity like anxiety 28.3%, depression 20.1%, PTSD 36.2% [11]. A Follow up on this report, was conducted by Jermacane et al; [5]. In 2016, they communicated the flood participants of the investigation to know if mental-morbidity impact still persists after two years and discovered the mental-morbidity prevalence remained elevated amongst flooded participants (anxiety 13.6%, depression 10.6%, PTSD 24.5%), thereby, showing a continuance of possible mental disorder morbidity following floods exposure for at least 2 years. They recommended that measures to resolve the persistent damage to homes ought to be made as this may lessen probable risk of psychological morbidity. On the contrary, Udoimuk et al., researched flood-hazards influence on health in the State of Cross River [16]. The study adopted a descriptive survey method. The result revealed that flood has no relative effect or wellbeing implication of those residing in such areas. This means that health implications and flood had no significant relationship. Also, the vulnerability due to occurrence of flood in low-resource/income countries according to Assanangkornchai et al., Ahern et al. and Fundter et al., will increase the global burden of disease, morbidity, mortality, social and economic disruptions, and will place a continuing stress on health services [17-19].

Taking a look at the situation that presents itself in Port Harcourt during the 2017 flood, one could easily identify certain above mentioned point leading to the assertion that the 2017 flood events may likely have affected the health of the populace in the community, thereby leading to morbidity (as the focus of this study), owing to the fact that morbidity in total is commonly defined as "departure from an overall state of health," but more specifically often referred to as the effect of illness, disease or injury in a population [20]. This paper hence aims to determine the morbidities experienced during and after the 2017 flood, so as to establish timely and adequate preventive measures and recommendable interventions to reduce the risks of flood and flood-related morbidity outcomes. Regarding the aim of this paper, the following questions and the answers that will be provided, forms the fundamentals and focus of this paper: What was the prevalence of morbidities experienced during and after the 2017 flood in Port Harcourt? Is there an association between the 2017 flood and the morbidities experienced in Port Harcourt?

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METHODOLGY

STUDY LOCATION

This study was conducted within the metropolis of Port Harcourt, Rivers State, and South-South region of Nigeria. It is situated along the Bonny River and is located in the Niger Delta. As of 2016, the Port Harcourt urban area has an estimated population of 1,865,000 inhabitants, up from 1,382,592 as of 2006 (21). A descriptive, cross-sectional study design was employed in this study. In carrying out this study, the study populations were heads of households aged ≥18 years residing in the flood affected areas/quarters of the community.

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SAMPLE SIZE

The minimum sample size was derived using the Fisher's formula: $n = \frac{(Z^2) \times pq}{(d^2)}$ [22].

Where: p = proportion of group p = 14.0% which was assumed because there is no similar study done so far. p= 14 ÷ 100 = 0.14; d = error margin= 5% = (1×5) ÷ 100 = 0.05; z = corresponding value to C.I (z = 1.96); q = non-proportion of group = 1 - p = 1 – 0.14 = 0.86. Thus, n = $(1.96)^2$ (0.14) (0.86) / $(0.05)^2$ = 185. Considering a 15% non-response rate = 15% × 185 = 27.75 =185 + 27.75 = 212.75= 210 (2 s. f); a final sample size of two hundred and ten (210) sample size was selected. A multistage sampling was conducted. The first stage was a clustered sampling of a centralized flood affected area. This made homogeneity and recruitment of sampling unit (houses) achievable. The second stage of sampling in this paper involved a systematic sampling of the sampling units which was achieved by deriving the sampling interval given as: $= \frac{\text{estimated number of houses in clustered streets}}{\text{allocated number of respondents}}$

In the case where eligible participants were unavailable during the data collection, the next individual in charge of the house aged ≥18 years was administered the questionnaire and whereby there were non-available, the next immediate household was taken.

The research data was primarily generated through the use of both quantitative and qualitative research methods. For the quantitative method, the study instrument used was the semi-structure self-administered questionnaire. This was designed to ensure ease of answers, taking into cognizance, the differences in assimilation of various respondents. The questionnaire was made up of both close and unrestricted questions which is grouped into sections, namely; socio-demographic characteristics, the 2017 flood experience, and the morbidity experiences (during and after the flood). In the qualitative method, the key informant interview was employed. The survey was supported with direct observation. During data collection, an official permission from the appropriate community leaders such as the community development committee chairman was first sorted for after presentation of ethical clearance, and then the selected respondents were enlightened with the study objectives before finally administering the questionnaires to the respondents and interviewing the community key informants. The quality of the data was assured by giving emphasis in designing the data collection tool, pre-testing the data and training the data collectors.

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STATISTICAL ANALYSIS

After data collection, the obtained field data was entered into the computer and then edited using Microsoft Excel to ensure order of the information. After entering and editing, the Statistical Package for Social Sciences (SPSS) version 20 was used to analyse the quantitative data while Nvivo version 12.0 was used for qualitative analysis to get statistical results displayed using tables. Analysis of the output/data involved descriptive and inferential statistics. The descriptive statistics was done by deriving mean, frequency, percentage and standard deviation of the data and the inferential statistics include chi-square test which was used to check if the differences that exist between variables are statistically significant. Meaningful conclusions from the study were drawn from these tests.

RESULTS

A total of 210 questionnaires were administered and 203 were sufficiently completed, remaining 7 questionnaires, this gave a response rate of 96.67%.

The socio-demographic characteristics of the respondents that ~~are~~were interpreted (as seen in table 1) include; sex, age, marital status and education. Under the sex composition of the respondents, a total of 55.2% female and 44.8% male were involved in the survey. The age distribution of the respondents ~~on~~in table 1 showed that, majority of the respondents fell between the ages group of 26-35 years, while the age group with the least participants' number were ~~between the ages~~ 66 and above, and the respondents mean age was 35.96±11.15. It was indicated that 116 (57%) were married, while 87 (43%) were unmarried. And based on the level of education of the respondents, majority of the respondents (55.2%) had secondary education while minority (3.4%) of the respondents had no education.

Quantitative findings

~~Morbidity Experiences~~ Frequencies of occurrence of morbidities

Table 2, shows the prevalence of morbidities experienced during and after the 2017 flood in Port Harcourt. 188(92.6%) indicated participants had morbidity experiences throughout the flood, while 73(36.0%) indicated participants had morbidity experiences after the flood. Amongst those who had morbidity experiences during and after/post the 2017 flood, the prevalence of the observed symptoms during the flood which include fever (85.8%), shaking chills (64.9%), body pains (54.0%), limb weakness (36.4%), diarrhea (53.2), Rice-water stool (9.0%), blood in stool (12.8%), fatigue (35.1%), nausea (32.4%), vomiting (34.6%), loss of appetite (56.6%), headache (63.3%), catarrh (68.9%), dry cough (38.6%), breathing difficulty (70.9%), sore throat (70.7%), ~~rashes (59.8%),~~ rashes (59.8), yellow skin (19.7%) and yellow eyes (15.5%), were higher compared to the observed symptoms after the flood. An exception of a higher prevalence of observed symptoms during flood as compared to after the flood is dark urine. The prevalence of dark urine is higher (56.2%) compared to that of during the flood (31.9%). For experienced injuries such as bruce, fracture and cut ~~respectively~~, the prevalence during the flood were higher (26.1%, 18.6, 20.2% respectively) compared to the experienced injuries after the flood. The prevalence of the psychological morbidity during the 2017flood which include; anxiety (81.5%) and stress (85.3%), were higher compared to psychological morbidity prevalence after the flood. Unlike the prevalence of anxiety and stress, worried of loss (79.9%) during the flood has a lower prevalence as compared to after the 2017 flood. Other morbidity experiences such as shock, sprain/strain, foot sores, object pierce, chilblains and bites indicated by the respondents were higher (54.5%) in prevalence during the flood, compared with after the flood (47.9%)

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Table 3, displays the chi-square test of association between the 2017 flood and the morbidities experienced in Port Harcourt. The result showed that the 2017flood was significantly associated with the morbidity experiences of the respondents during and after~~/post~~ the flood occurrence at p-value = 0.00 (X^2 = 141.88; 95% C.I: 12.26, 40.63). Under the observed symptoms, flooding was significantly associated with an increased number of fever cases during the flood which was 5.14 times higher than the fever case after the flood (X^2 = 29.59, p-value <0.05). For shaking chills, the odds amongst respondents with morbidity experiences during the flood were 2.01 times significantly higher than the cases after the flood, with a 95% C.I ranging from 1.16 to 3.47 (X^2 = 6.30, p-value <0.05). For cases of dark urine, the number after the flood had 0.37 times significant higher odds than the cases during the flood, with a 95% C.I ranging from 0.21 to 0.64 (X^2 = 13.03, p-value <0.05). For diarrhoea cases, the odds amongst respondents during the flood were 1.72 times significantly higher than the cases after the flood, with a 95% C.I ranging from 1.00 to 2.99 (X^2 = 3.81, p-value <0.05). Also respondents with cases of catarrh during the flood had 8.89times significantly higher odds than the catarrh cases after the flood, with a displayed 95% C.I ranging from 4.65 to 16,98 (X^2 = 51.50, p-value <0.05). The odds for the cough cases during the floods were identified to be 3.23 times significantly higher than the cough cases after the flood, and the 95% C.I ranged from 1.63 to 6.40 (X^2 = 12.00, p-value <0.05). Based on the cases of breathing difficulty, a significantly higher odd of 3.79 were identified during the flood as compared to the cases following the flood (X^2 = 45.80, p-value <0.05).

Similar to the breathing difficulty cases, the odds of sore throat cases during the flood were 6.87 times significantly higher than the cases of sore throat after the flood and this showed a 95% C.I ranging between 3.73 and 12.65 (X^2 = 43.23, p-value <0.05). Finally under the observed morbidity symptoms, the odd cases of rashes were 5.83 times significantly higher during the flood than after the flood with a 95% C.I ranging from 3.08 to 11.03 (X^2 = 32.93, p-value <0.05). Under the morbidity experienced injuries, table 3 indicated that there was no statistical significance in the chi-square association between the 2017 flood and the morbidity experiences. Based on the psychological morbidity experiences of the respondents, table 3 indicated a statistical significance of association between the 2017 flood and morbidity experiences (at p-value <0.05); where the odd cases of anxiety during the flood were 0.26 times significantly higher than the anxiety case after the flood (X^2 = 6.72, p-value <0.05); and the odd cases of respondents worried of loss during the flood were 0.17 times significantly higher than the cases after the flood with a 95% C.I ranging from 3.08 to 11.03 and X^2 = 32.93 (p-value <0.05). Other morbidity experiences (such as sprain/strain, chilblains, foot sores, bites and shock) identified by the

respondents, were not statistically significant (as shown in table 3), but the odd cases were 1.32 times higher during the flood than after the flood.

Qualitative findings

The qualitative finding of this study is presented on table 4. This was obtained after an interview (guided by the study objectives) with three (3) key informants in Port Harcourt.

The key informants that were interviewed identified several morbidities experienced during and after the 2017 flood. The morbidities experienced during the flood were water borne and vector borne diseases (11), physical injuries (1) while trying to evacuate, and social and psychological conditions (5). The very few identified morbidity experiences after the flood were post flood conditions (3); such as high blood pressure.

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The responsibilities assumed by the local authorities so as to manage the flood effects were recognized as intervention and advocacy (2), flood management strategies (2) such as encouraging affected residents, evacuation and provision of relief materials, and flood prevention strategies (2); such as encouraging settlements outside flood prone areas and education on waste discarding appropriateness.

The responsibilities that the Government, NGOs and other relevant bodies assumed in an attempt to curb the flood damages caused were noted as provision of relief materials (3); like food and mattresses, and public shelter (1).

The opinions/recommendations given by the key informants on how to control flood menace include; proper environmental management (3) to control environmental abuse (such as disposal of waste in drainages and building of structures at flood prone areas), improved attitudes and implementation of effective policies relating to flood (3), provision of effective and prompt flood warning systems against flood events (1), effective intervention or management of flood proceedings (2) by government and other agencies/ institutions.

DISCUSSION

Morbidities Experienced

Morbidities experienced of flood-affected population are a major public health concern. This study provides detailed morbidities experienced during and after the 2017 flood in Port Harcourt, which were majorly categorized into; illness, injuries and psychological effects (table 2 and 3), similar to several studies from Germany [22], England and Wales [23]. WHO in conformity to this study, reported that the health effects observed during and after floods include injuries, infections, and poisoning and greater mental-health problems [1]. Generally as revealed by this study, the prevalence of morbidities experienced amongst flood-affected respondents were significantly higher (92.6%), during the flood as compared to after the flood, with increased odds of 22.32 and X^2= 141.88(at $p<0.05$). Hence, this study rejects the null hypothesis (H_0) and retains the alternate hypothesis (H_1) which states that: there is an association between the 2017 flood and the morbidities experienced in Port Harcourt, at $p<0.05$. This study finding corroborates to the study of Landoh et al., and Carroll et al., [24, 25].

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- **Illness**

A number of illnesses experienced during and after the 2017 flood have been identified in this study ~~(table 2 and 3).~~ These illnesses were caused by ~~varying~~different agents (such as viral, bacteria, fungi and protozoa), due to unhygienic ~~flood~~ water exposure which can occur through various routes of infections; such as inhalation, ingestion and insect transmission ~~and infections~~. These illnesses may also have resulted from the disruption of sewage disposal and flood water depth. The prevalence of these illnesses during the flood was higher when compared to the illnesses experienced after the ~~2017~~ flood, and the illness with the highest frequency during the flood was fever (85.8%); but an exception of the prevalence of these illnesses is dark urine with a higher prevalence post-flood event, compared to during flood event. Of these illnesses experienced, the odds ratio of some of them (including fever, shaking chills, dark urine, diarrhea, catarrh, cough, difficulty in breathing, sore throat and rashes) was significantly high (at $p<0.05$), indicating an association between floods and morbidity illnesses (table 3). This study is concurrent to other studies like in Germany [22,26] and to the multicentre research of Obanga [27] in Ahoada East and Ahoada West Local government area. Also, fever which could be

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seen as a major symptom of malaria and other vector borne diseases was seen to be the highest occurring decimal according to the survey. This could be corroborated by the study carried out by Ahern and colleagues in 2005 which revealed that there is a potential for increased vector-borne illnesses and endemic levels of diarrheal disease, especially in areas with poor sanitation. Also, the 2012 study of Oriji on the flooding that occurred that same year in Rivers state also outlined fever and gastrointestinal disorders (cholera, dysentery and diarrhoea) as the most occurring morbidities, and attributed them to results from contaminated drinking-water and exposure to waste water facilities ~~exposure~~ [28]. These findings were not too far from that of Obanga [27] when he studied the effects of flooding menace on health and housing in two communities of Ahoada east and west local government areas of Rivers state. Although his result showed ~~that~~ that the morbidity with the highest prevalence was Cough (45%), it was closely followed by malaria/fever (44%), in supporting the outcome of the present study. These illnesses may have led to certain general illnesses reported by US [23] and Germany [26], which are detailed as: respiratory illness, gastrointestinal illness, skin and eye irritation and infection.

Also, the respiratory illnesses namely: catarrh, cough, sore throat and difficulty in breathing were all reported by the findings of this study to be significantly associated to the 2017 flood (at $p<0.05$). According to a study carried out by the Flood Hazard Research Centre (FHRC), in conformity to this study, reported chest infections, asthma, flu, coughs and colds to be due to the flooding in the North East of England [23].The gastrointestinal illnesses such as diarrhea, rice-water stool, blood in stool, nausea, vomiting, and loss of appetite are flood related illnesses commonly implicated by vector and water borne infections [29]. Amongst these gastrointestinal illnesses, the study reveals that the peak in diarrhea morbidity is associated with flooding (p-value = 0.05) as the prevalence of the illness (52.2%) during the flood was identified to be significantly with O.R = 1.72; $X^2 = 3.81$; and 95% C.I: 1.00 – 2.99. Several researches such as; Acuinjet et al., Wade et al., and Cann et al., [22, 24, 25], are in conformity to the study. The skin and eye illnesses include; yellow eyes, yellow skin and rashes which were all identified to have higher prevalence during the 2017 flood than post the flood. Amongst these illnesses, rashes was revealed to be significantly associated with the 2017 flood, at p-~~value~~ = 0.00. This conforms to the study of Tunstall et al., and WHO [23, 30].

- **Injuries**

The relatively minor flood injuries that occurred during and post the 2017 flood include bruises and cuts; while some others indicated include sprain/strain, bites, foot sores, chilblains and object pierce. The more serious flood injury revealed was fracture, which was less experienced by a frequency of 18.6% during the flood and 15.8% after the flood. The injuries which according to Bich et al., [31] could be attributable to falls and clattering into some unobserved items beneath the water flooded areas, occurred during the flood may have been sustained in the process of evacuation (while trying to remove themselves, family and valuables), while the post-flood injuries may have been sustained during the cleanup process, when the evacuated residents begin to return to their homes [32]. The prevalence of the injuries experienced during the flood were higher than the post-flood injuries ~~(table 2)~~; where the odds of bruise, cuts and fractures respectively were 1.49, 1.80 and 1.29 times respectively higher. Irrespective of the prevalence of the flood injuries, this study result revealed that the injuries experienced during and post the 2017 flood in Eneka community was not flood significant ~~(table 3)~~. This is similar to the CCASHH project in Europe that revealed no survey information on significant flood injuries [32]. In agreement with this study is the research conducted by the Health Protection Agency in London, which revealed that the significance of an injury will depend on the local hazards and type of flood [33].

- **Psychological effects**

Living throughout a flood event according to Jermacane et al [5], can be distressing and the consequence ~~for~~on people's mental health can be profound. This founds the bases of several studies carried out on the common effects of flood on psychological disorders, amongst which are; the Psychosocial impact of the summer 2007 floods in England by Paranjothy et al., [34], and English National Cohort Study of Flooding and Health by Waite et al., [11]. Findings from these studies were no different from the findings from this paper which also pointed towards stress, anxiety and depression as the common psychological disorders accompanying the flooding event. These reported flood-common mental health outcome according to Tunstall et al, [23] could be attributed to certain flood vulnerability factors like the depth of flood, worried for loss, the strenuous evacuation process, contamination of ~~flood~~ water, less or warning system and recovery process. The mental health symptoms prevalence was established higher amongst flood affected homes and flooding was associated with increased odds of all outcomes [33, 34]. These above studies are in corroboration with the findings of this study, which showed that the prevalence (table 2) of the three most common psychological disorder (anxiety, stress and depression respectively), were higher during the flood (81.5%, 85.3% and 79.9% respectively), as compared to the psychological morbidities experienced after the flood (54.8%, 84.9% and 61.6% respectively), and the

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odds were significantly high (table 3) showing an association between the 2017 flood and the psychological morbidities (at $p<0.05$). In corroboration to this study, Carroll et al., have conducted interviews with people who were flooded during the Carlisle floods and noted that many respondents spoke of psychological stress [25].

Conclusion

The morbidities experienced during and after the 2017 floods in Port Harcourt were substantial and significant on the households and community, causing them to be physically injured, psychologically unstable, highly exposed to certain illnesses and relatively displaced.

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TABLES AND FIGURES

Table 1: Distribution of the socio-demographic characteristics of the respondents

Characteristics	Frequency (N = 203)	Percentage (%)
Sex		
Male	91	44.8
Female	112	55.2
Age (years)		
18 - 25	25	12.3
26 - 35	90	44.3
36 - 45	48	23.6
46 - 55	27	13.3
56 - 65	10	4.9
≥66	3	1.5
Mean ± SD	35.96 ± 11.15	
Marital Status		
Married	116	57.1
Unmarried	87	42.9
Educational Status		
None	7	3.4
Primary	17	8.4
Secondary	112	55.2
Tertiary	67	33.0

Table 2: Prevalence of the morbidity experiences of respondents during and post the 2017 floods in Port Harcourt

Question(s)	During		After	
	Yes (%)	No (%)	Yes (%)	No (%)
Did you experience any Morbidity	188 (92.6)	15 (7.4)	73 (36.0)	130 (64.0)

Morbidity Experienced				
Illnesses				
Fever	162 (85.8)	26 (14.2)	40 (54.8)	33 (45.2)
Shaking chills	122 (64.9)	66 (35.1)	35 (47.9)	38 (52.1)
Body pains	101 (54.0)	87 (46.0)	38 (52.1)	35 (47.9)
Limb weakness	69 (36.4)	119 (63.6)	23 (31.5)	50 (68.5)
Dark urine	60 (31.9)	128 (59.1)	41 (56.2)	32 (43.8)
Diarrhea	100 (53.2)	88 (46.8)	29 (39.7)	44 (60.3)
Rice-water stool	17 (9.0)	171 (91.0)	6 (8.2)	67 (91.8)
Blood in stool	24 (12.8)	164 (87.2)	9 (12.3)	64 (87.7)
Fatigue	66 (35.1)	122 (64.9)	20 (27.4)	53 (72.6)
Nausea	61 (32.4)	127 (67.6)	18 (25.0)	55 (75.0)
Vomiting	65 (34.6)	123 (65.4)	24 (32.9)	49 (67.1)
Loss of appetite	106 (56.6)	82 (43.4)	32 (43.8)	41 (56.2)
Headache	119 (63.3)	69 (36.7)	44 (60.3)	29 (39.7)
Catarrh	131 (68.9)	57 (31.1)	15 (20.5)	58 (79.5)
Dry cough	73 (38.6)	115 (61.4)	12 (16.4)	61 (83.6)
Breathing difficulty	133 (70.9)	55 (29.1)	18 (24.7)	55 (75.3)
Sore throat	133 (70.7)	55 (29.3)	19 (26.0)	54 (74.0)
Rashes	113 (59.8)	75 (40.2)	15 (20.5)	58 (79.5)
Yellow skin	37 (19.7)	151 (80.3)	08 (10.9)	65 (89.1)
Yellow eyes	29 (15.5)	159 (84.5)	08 (10.9)	65 (89.1)
Injuries				
Bruise	49 (26.1)	139 (73.9)	14 (19.1)	59 (80.9)
Fracture	35 (18.6)	153 (81.4)	11 (15.8)	62 (84.2)
Cut	38 (20.2)	150 (79.8)	09 (12.3)	64 (87.7)
Psychological effects				
Anxiety	154 (81.5)	34 (18.5)	40 (54.8)	33 (45.2)
Stress	162 (85.3)	26 (14.7)	62 (84.9)	11 (15.1)
Depression	151 (79.9)	37 (20.1)	45 (61.6)	28 (38.4)
Others (such as; chilblains, shock, sprain, bites, etc)	103 (54.5)	85 (45.5)	35 (47.9)	38 (52.1)

Table 3: Chi-square test of association between the 2017 flood and the morbidity experiences

Response	Morbidity Experiences		Chi-square		Odds Ratio	95% C.I	
	During Flood	After Flood	X^2	P-value		Lower	Upper
Yes	188 (92.6)	73 (36.0)	141.88	**0.00**	22.32	12.26	40.63
No	15 (7.4)	130 (64.0)					

Morbidity Experienced	During Flood	After Flood	Chi-square		Odds Ratio	95% C.I	
			X^2	P-value		Lower	Upper
Illnesses							

Fever							
Yes	162 (85.8)	40 (54.8)	29.59	**0.00**	5.14	2.77	9.55
No	26 (14.2)	33 (45.2)					
Shaking chills							
Yes	122 (64.9)	35 (47.9)	6.30	**0.01**	2.01	1.16	3.47
No	66 (35.1)	38 (52.1)					
Body pains							
Yes	101 (54.0)	38 (52.1)	0.06	0.81	1.07	0.62	1.84
No	87 (46.0)	35 (47.9)					
Limb weakness							
Yes	69 (36.4)	23 (31.5)	0.62	0.43	1.26	0.71	2.24
No	119 (63.6)	50 (68.5)					
Dark urine							
Yes	60 (31.9)	41 (56.2)	13.03	**0.00**	0.37	0.21	0.64
No	128 (59.1)	32 (43.8)					
Diarrhea							
Yes	100 (53.2)	29 (39.7)	3.81	**0.05**	1.72	1.00	2.99
No	88 (46.8)	44 (60.3)					
Rice-water stool							
Yes	17 (9.0)	6 (8.2)	0.04	0.83	1.11	0.42	2.94
No	171 (91.0)	67 (91.8)					
Blood in stool							
Yes	24 (12.8)	9 (12.3)	0.01	0.92	1.04	0.46	2.36
No	164 (87.2)	64 (87.7)					
Fatigue							
Yes	66 (35.1)	20 (27.4)	1.41	0.23	1.43	0.79	2.60
No	122 (64.9)	53 (72.6)					
Nausea							
Yes	61 (32.4)	18 (25.0)	1.51	0.22	1.47	0.79	2.71
No	127 (67.6)	55 (75.0)					
Vomiting							
Yes	65 (34.6)	24 (32.9)	0.07	0.80	1.08	0.61	1.91
No	123 (65.4)	49 (67.1)					
Loss of appetite							
Yes	106 (56.6)	32 (43.8)	3.32	0.07	1.66	0.96	2.86
No	82 (43.4)	41 (56.2)					
Headache							
Yes	119 (63.3)	44 (60.3)	0.21	0.65	1.14	0.65	1.98
No	69 (36.7)	29 (39.7)					
Catarrh							
Yes	131 (68.9)	15 (20.5)	51.50	**0.00**	8.89	4.65	16.98
No	57 (31.1)	58 (79.5)					
Dry cough							
Yes	73 (38.6)	12 (16.4)	12.00	**0.00**	3.23	1.63	6.40
No	115 (61.4)	61 (83.6)					
Breathing difficulty							
Yes	133 (70.9)	18 (24.7)	45.80	**0.00**	7.39	3.98	13.71
No	55 (29.1)	55 (75.3)					
Sore throat							
Yes	133 (70.7)	19 (26.0)	43.23	**0.00**	6.87	3.73	12.65
No	55 (29.3)	54 (74.0)					
Rashes							
Yes	113 (59.8)	15 (20.5)	32.93	**0.00**	5.83	3.08	11.03
No	75 (40.2)	58 (79.5)					
Yellow skin							
Yes	37 (19.7)	08 (10.9)	2.80	0.09	1.99	0.88	4.51
No	151 (80.3)	65 (89.1)					

Yellow eyes								
	Yes	29 (15.5)	08 (10.9)	0.86	0.35	1.48	0.64	3.41
	No	159 (84.5)	65 (89.1)					
			Injuries					
Bruise								
	Yes	49 (26.1)	14 (19.1)	1.36	0.24	1.49	0.76	2.90
	No	139 (73.9)	59 (80.9)					
Fracture								
	Yes	35 (18.6)	11 (15.8)	0.46	0.50	1.29	0.62	2.70
	No	153 (81.4)	62 (84.2)					
Cut								
	Yes	38 (20.2)	09 (12.3)	2.21	0.14	1.80	0.82	3.94
	No	150 (79.8)	64 (87.7)					
			Psychological effects					
Anxiety								
	Yes	154 (81.5)	40 (54.8)	6.72	**0.01**	0.26	0.09	0.77
	No	34 (18.5)	33 (45.2)					
Stress								
	Yes	162 (85.3)	62 (84.9)	0.07	0.80	1.11	0.52	2.37
	No	26 (14.7)	11 (15.1)					
Depression								
	Yes	151 (79.9)	45 (61.6)	9.82	**0.00**	0.17	0.05	0.59
	No	37 (20.1)	28 (38.4)					
Others (shock, sprain, bites, etc)								
	Yes	103 (54.5)	35 (47.9)	0.99	0.32	1.32	0.77	2.26
	No	85 (45.5)	38 (52.1)					

Table 4: Frequency, meaning and explanation of themes derived from key informant interview.

Theme	Meaning	Categories	Frequency	Total	Evidence
Morbidity experiences	Diseases and other health related conditions suffered by the people of Eneka Community during the 2017 flood	Water and vector borne diseases/ conditions	11	20	The health of the people was greatly affected during the flood. So many had foot sores, rashes, and diarrhea. The children, especially those in families who remained, were very sick (**Key informant 3**).
		Physical injuries	1		
		Social and Psychological conditions	5		
		Post flood conditions	3		
		Evacuation/ Relocation	2		
Local Authorities	The role played by Local authorities in order to manage the effects of the flood	Intervention/ advocacy	2	6	They called on governments' attention for adequate construction of drainages and provision of relief supplies to the affected residents (**Key informant 2**).
		Flood management strategies	2		
		Flood prevention strategies	2		
Institutional assistance	The role played by Government, NGOs and other	Relief materials	3	4	Some relief materials were sent by the government and NGOs (**Key informant 2**).

	relevant bodies in an effort to control the flood caused damages	Shelter	1		
Public opinion	Suggestions by the Community members and leaders on how to present and or manage flooding should it occur	Proper environmental management	3	9	Early warnings should be given about floods. Residents should avoid settling in flood prone localities (**Key informant 1**).
		Attitude/ Policies	3		
		Early warning	1		
		Intervention/ management	2		

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