

Food Insecurity, Malnutrition and Crude Oil Spillage in a Rural Community in Bayelsa State, South-South Nigeria

*Ordinoha B FMCPH, **Sawyer W MBBS

*Community Medicine Department University of Port Harcourt Teaching Hospital, Port Harcourt **Community Medicine Department University of Port Harcourt Teaching Hospital, Port Harcourt

Abstract

Background: Oil is the main stay of Nigeria's economy, but most residents in the oil producing communities still depend entirely on the environment for their sustenance; and so likely to have a problem of food security in the event of a deleterious impact on the environment. This study is to examine the effect of a major crude oil spillage on household food security, and the nutritional status of under-five children in the affected communities. This oil spillage occurred in May 2000, in Etiama Nembe, a rural community in Bayelsa State, south-south Nigeria.

Method: The study was carried out six months after the spill, using cross-sectional, external control group study design, with a semi-structured questionnaire and anthropometry as the study tools. The study participants were chosen using a two-stage cluster sampling technique. The questionnaire assessing food insecurity was administered on an adult woman in each of the chosen households, while the anthropometric measurements were taken for every under-five year child in the household.

Results: A total of 592 questionnaires were administered and retrieved in both study communities, while anthropometric measurements of 956 under-five year children were taken. There were no significant differences in the age and occupations of the respondents, and in the sizes of their households; although, the respondents in the exposed communities were significantly better educated (p -value < 0.001). There were significant differences in the study groups, in household food security (p -value < 0.000001), and in the prevalence of under-five children with underweight (p -value < 0.0001), and wasting (p -value < 0.01).

Conclusions: Crude oil spillage can increase household food insecurity and childhood malnutrition in the affected communities. Efforts should always be made to provide food aid to affected communities, irrespective of the cause of the spillage.

Keywords: Pipeline oil spill, household food security, malnutrition, rural community, Nigeria.

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Introduction

Oil was first discovered in commercial quantity in Nigeria in 1956, in Olobiri, in the present Bayelsa State; two years later, in 1958, Nigeria joined the league of oil exporting countries.¹ Nigeria has since become the largest oil producer in Africa, and the fifth largest in the Organization of Oil Producing Countries (OPEC).¹ In 2004, Nigeria exported an average of 2.5 million barrels of crude oil every day, and with an oil reserve conservatively put at 35 billion barrels, this would continue for at least the next 40 years. The revenue from oil has grown since 1958, to become Nigeria's chief revenue earner, responsible for 90% of foreign exchange earning, and contributing more than 40% of the country's Gross Domestic Product (GDP).²

All of Nigeria's proven oil reserves are located in the coastal area of the Niger delta, in about 250 small (less than 50 million barrels) oil fields. The Niger delta is the home of several minority ethnic groups in Nigeria, and the largest wetland in Africa, covering an area of 20,000 square kilometers, of which about 6000 square kilometers is mangrove forest¹.

While the country reaps bountifully from the oil, there have been agitations in the oil producing areas over environmental degradation, and the sharing of the oil revenue¹. Oil exploitation and exploration activities have been associated with serious environmental degradation of the Niger delta, where the mangrove forest is particularly vulnerable to oil spills, as its soil soaks up the oil like sponge. Oil spillages are common fallouts of oil exploitation, exploration and transportation activities in the Niger delta. According to official statistics, an average of 300 major oil spillages take place in the Niger delta every year, spilling approximately 2,300 cubic meters of crude oil into the environment¹.

Unfortunately, most communities in the Niger delta still depend entirely on the environment for their sustenance being predominantly farmers and fisher folk; and are therefore more likely to have a problem of food security in the event of a deleterious impact on the environment.³⁻⁵

This study is to examine the effect of a major crude oil spillage on food security, and the nutritional status of under-five children in the affected communities. This oil spillage occurred in May 2000, in Etiama Nembe, a rural community in Bayelsa State, south-south Nigeria.

Method

Study area: The oil spill took place on 16th May, 2000 following a breach in the crude oil pipeline belonging to a major oil company in Nigeria. This breach occurred a few kilometers from Etiama Nembe, in Bayelsa State, south-south Nigeria, and was repaired after a few days, but not before an estimated 2, 500 barrels of crude oil had been spilled into the surrounding water bodies, forest and farms; seriously contaminating an area of about 20 hectares. The wrangling over the cause of the spillage delayed its cleanup, such that the cleanup was only commenced several weeks after the spillage was controlled.

Etiama and most of the 112 closely located communities, farming and fishing settlements that made up the Nembe clan were officially affected by the oil spillage. The Nembe communities are located in the south-eastern part of Bayelsa State, south-south Nigeria, and share boundaries with the Atlantic Ocean. They have a riverine terrain, with several rivulets, islands, and mangrove forest. As at the time of the spill in 2000, the communities had an estimated population of 206, 628 people, made up of mostly fisher folk and subsistence farmers (projected with the 1991 National census, and with an annual growth rate of 2.8%⁶).

Study design: The study was carried out six months after the spill, in November 2000. A cross-sectional, external control group, study design was used⁷, with an interviewer-administered, semi-structured questionnaire and anthropometry as the study tools. The communities in the Kolukoma/ Opokuma Local Government Area of Bayelsa State were used as the external control group. These communities were chosen because they had little oil exploration and exploitation activities, for their proximity to the Nembe communities, and the fact that they have the same terrain, and share similar socio-demographic and economic characteristics with the Nembe communities.

Sample size estimation: The study was designed to detect a 10% difference in proportion of children with malnutrition, and households with food insecurity, with an alpha error of 5%, acceptable beta error of 20%, and a statistical power of 80%; and assuming a 21% prevalence in the control communities⁶. Using the usual formula for sample size determination for comparing proportions from two populations⁸, the minimum required sample size was thus determined to be 573, but made up to 600 to take care of non-responses.

Sampling technique: A multi-stage sampling technique was used for the study. At the first stage, tables listing the communities in each of the study groups were drawn up with the assistance of the indigenes and community leaders. There were 112 communities in Nembe, while 45 communities made up the Kolokuma / Opokuma clan that was used as the control for the study. Out of these communities, 30 were randomly selected for each of the study groups, using the table random number.

The second stage of the process involved the selection of households. A household was defined as an aggregation of persons who lived together and shared a common source of food; but the sampling unit was the houses in the study communities. The total number of the houses in the study communities was determined, and houses for the study chosen by using a sampling fraction of one in five, after the first house had been randomly selected. Once a house is chosen, all the households residing in the house were studied.

The questionnaire assessing food insecurity was administered on an adult woman in each of the households, while the anthropometric measurements were taken for every under-five year child in the household.

Data collection: The data were collected by SW (the second author), and assisted by four assistants recruited from the communities. These assistants were trained on questionnaire administration, and on anthropometric measurement, using the training and standardization manual developed by the Food and Nutrition Technical Assistance Project (FANTA).⁹

Food security was defined by the Food and Agriculture Organization of the United Nations as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for active and healthy life¹⁰, but for the

purposes of this study, we used the definition offered in a national nutritional survey in Nigeria¹¹ that defined food security as the ability of the household to secure, either from its own production or through purchases, foods enough to meet the dietary needs of members of the household. Thus, the food insecurity experience of the respondents was assessed using a set of 10 questions adopted from the Cornell-Radimer Food Security Scale¹².¹³ Specifically, questions were designed to tap into food insecurity-related coping behaviours such as reduction in the number and variety of meals eaten in the household, changes in the ingredients used in preparing the food, and going to bed hungry due to lack of food. The Cornell-Radimer scale was used for its validity, affordability and easy of administration.¹⁴

The anthropometry of the under-five children was measured using a bathroom weighing scale, and a locally constructed standometer; and carried out according to the standard method.⁹ Three types of malnutrition were assessed in the study: underweight measured by weight-for-age, and defined as weight-for-age Z score (WAZ) < -2, stunting measured by height-for-age, and defined as height-for-age Z score (HAZ) < -2; and wasting measured by weight-for-height, and defined as weight-for-height Z score (WHZ) < -2.¹⁵

Data analysis: Data handling and analysis were carried out using EPI-INFO version 2002, Microsoft word, and manually. Summary measures were calculated for each outcome of interest. The analysis of the food security situation used the hypothesis that food insecurity and hunger is an ordered sequential phenomenon that starts with the household expressing concerns over the availability of food, and ends with the household's inability to protect the children from the food shortage¹². The prevalence of food insecurity in the households of the respondents was thus classified into five: food secure, food uncertainty, food insecure without hunger, food insecure with moderate hunger, and food insecure with severe hunger. Households were said to be food secure, when they did not affirm to any of the survey questions. Those classified as food uncertain, were those that only expressed concern over their household's ability to secure enough food, but did not affirm to any other survey question. Households classified as being food insecure without hunger, were those with food security concerns that had made adjustments to prevent hunger, having affirmed only to questions 5, 6, 7, 10 of the survey instrument. Food insecure with moderate hunger was used for households that affirmed to questions 1, 3, 8, where adult members went hungry by eating less,

skipping meal, or even going a whole day with out meal; while food insecure with severe hunger encompassed households that affirmed to questions 2, 4, 9; where children went hungry, by eating less, skipping meals, or had suffered loss of weight as a result of inadequate food.

The Z-scores for weight-for-age, height-for-age and weight-for-height were calculated using the reference data from the United States National Center for Health Statistics (NCHS), and the World Health Organization, as contained in EPI-INFO version 2002¹⁵. For all statistical tests, P-value of 0.05 or less was considered statistically significant

Results

A total of 592 questionnaires were administered and retrieved in both study communities, while anthropometric measurements of 956 under-five year children (521 in exposed communities, and 435 in control) were taken. The socio-demographic characteristics of the respondents are summarized in Table I. There were no significant differences in the age and occupations of the respondents, and in the sizes of their households. However, the respondents in the exposed communities were significantly better educated (p-value < 0.001), mainly due to the higher number of respondents with tertiary education. Though there was a significant difference in the occupational classifications of the spouses of the respondents; farming and fishing were the main occupations, with very few engaged in paid employment, in the civil service or in the oil companies (12.29% in the exposed communities, and 7.90% in the control communities). There were also more logging activities in the exposed communities.

Table II shows the prevalence of household food insecurity in the study communities. There was a significant difference in household food security (p-value < 0.000001), with only 2.99% of the households in the oil spill affected communities classified as being food secure, compared to 66.67% in the control communities; and 34.88% classified as being food insecure with moderate hunger, compared to 2.41% in the control communities.

However, in spite of the significant difference in household food security, there was no such difference in the prevalence of stunted under-five children (p-value > 0.05) as shown in Table III. But, significant differences were observed in the prevalence of underweight (p-value < 0.0001), and wasting (p-value < 0.01).

Table I: The socio-demographic characteristics of study participants

Variable	Exposed (%) (N = 301)	Control (%) (N = 291)	p-value
Age			
14 – 19 years	2 (0.66%)	3 (1.03%)	
20 – 29 years	87 (28.9%)	77 (26.46%)	
30 – 39 years	102 (33.89%)	93 (31.96%)	> 0.05
40 – 49 years	73 (24.25%)	87 (29.9%)	
>/ 50 years	37 (12.29%)	31 (10.65%)	
Educational status of respondents			
No formal education	51 (16.9%)	63 (21.65%)	
Primary	93 (30.9%)	124 (42.61%)	< 0.001
Secondary	147 (48.84%)	103 (35.4%)	
Tertiary	10 (3.32%)	1 (0.34%)	
Occupation of respondent			
Farming	103 (34.22%)	113 (38.83%)	
Fishing	98 (32.56%)	87 (29.9%)	> 0.05
Paid employment	3 (1%)	0 (0.00%)	
Student	23 (7.64%)	27 (8.97%)	
Housewife only	74 (24.58%)	64 (21.99%)	
Occupation of respondents' spouse			
Farming	73 (24.25%)	97 (33.33%)	
Fishing	94 (31.89%)	112 (38.49%)	
Paid employment	37 (12.29%)	23 (7.90%)	< 0.0001
Logging	39 (12.96%)	6 (2.06%)	
Unemployed	58 (19.27%)	53 (18.21%)	
Number of persons in respondent's household			
1 – 3	51 (16.94%)	39 (13.40%)	
4 – 6	167 (55.48%)	171 (58.76%)	> 0.05
7 – 9	76 (25.25%)	63 (21.65%)	
>/ 10	7 (2.33%)	18 (6.19%)	

Table II: Prevalence of household food insecurity

Food security status	Exposed Community (N = 301)	Control Community (N = 291)	p-value
Food secure (%)	9 (2.99%)	194 (66.67%)	< 0.00001
Food uncertainty	22 (7.31%)	67 (23.02%)	< 0.001
Food insecurity without hunger	76 (25.25%)	23 (7.90%)	< 0.001
Food insecurity with moderate hunger	105 (34.88%)	7 (2.41%)	< 0.0001
Food insecurity with severe hunger	89 (29.57%)	0 (0.00%)	< 0.0001

$\chi^2 = 367.74$ (p-value < 0.000001)

Table III: Prevalence of childhood malnutrition

Characteristics	Exposed (N = 521)	Control (N = 435)	p-value
1. Prevalence of underweight (WAZ < -2)	246 (47.22%)	101 (23.22%)	< 0.0001
2. Prevalence of stunting (HAZ < -2)	149 (28.6%)	(25.98%)	> 0.05
3. Prevalence of wasting (WHZ < -2)	109 (20.92%)	58 (13.33%)	< 0.01

Appendix: Survey items used to assess household food security

PLEASE give us information concerning experiences in your household in the past THREE MONTHS

1. Have you or any other adult member of your household skipped a meal or more due to inadequacy of food?
2. Have your children skipped a meal due to inadequacy of food?
3. Have you dished out less food to your self and/or other adult members of your household due to insufficiency?

4. Have you dished out less food to your children due to insufficiency?
5. Have you bought food items you don't really like due to lack of money?
6. Have you been forced to cook soup without meat or fish?
7. Have you been forced to eat the same food day after day because of lack of money?
8. Have you or other adult members of your household gone a whole day without a meal due to lack of food to eat?
9. Have any of your children lost weight as a result of inadequate food?
10. Have there been occasions when you worried about not having enough food for members of your household?

Note: Respondents answered yes or no to each of the questions.

Discussion

The findings of this study confirms the study hypothesis that crude oil spillage can increase household food insecurity and childhood malnutrition in the affected communities. The data obtained in the oil spill affected communities were not only worse than those of the control communities, but were about the worst in Nigeria.^{6, 11} A 2003 national nutritional survey had a national average of household food security of 25%, with the worst in the moist savanna zone, with a prevalence of 10%;¹¹ whereas only about 3% of households in the oil spill affected communities had food security. Also, the national prevalence of underweight children was 29% according to the 2003 National Demographic and Health Survey (NDHS)⁶, with the north-west geopolitical zone as the worst with a prevalence of 42.9%; but a prevalence of 47.22% was found in the oil spill affected communities, even when the average in south-south Nigeria was 18.0%.

Furthermore, the fact that significant differences were observed in the prevalence of wasting and underweight between the two study populations, and not in the prevalence of stunting, indicates a recent deterioration in the food situation in the communities affected by the crude oil spillage. These impacts are not unexpected with such damage to an environment that sustains a population⁴, especially in a situation of a near complete absence of outside relief assistance. A study carried out in the nearby Delta State had warned that crude oil spillage can lead to massive reduction in crop yield, land productivity, and farm income⁵.

Even when the risks posed by the oil spillage were clear, it is rather baffling that the government and the oil company that owned the pipeline that leaked the oil would choose not to provide relief materials to the affected communities, on the guise that the oil spillage was caused by sabotage. Nigerian Oil Pipeline Act provides for compensation payment only when the oil

spillage is not caused by the individual's own default or on account of the malicious act of a third person.¹⁶ Although this clause was added to discourage sabotage, but blatantly allowing whole communities to suffer the full consequences of a crime committed by a few individuals, can be viewed as collective punishment. It is unfair for any government in Nigeria to allow citizens to go through hunger no matter the circumstance, when it was clearly stated in Chapter II, Section 14 of the Nigerian constitution that the primary purpose of government is the welfare of the people. The right to food is a fundamental human right that should not be denied any citizen, especially in the circumstances the communities affected by the oil spillage found themselves. The Food and Agriculture organization of the United Nations had in a 2003 publication remarked that "hunger in the midst of plenty is not just a moral outrage, but an infringement of the most basic of human rights: the rights to adequate food"¹⁷.

The hunger suffered by the communities affected by the oil spillage cannot just be counted in terms of hunger pangs, because under-nutrition is often a harbinger for other health and productivity problems.^{18, 19} For example, 50 -70% of the burden of diarrhoeal diseases, measles, malaria and lower respiratory infections in children is

attributable to undernutrition²⁰, while several studies have established a relationship between productivity and malnutrition.^{18,21}

Major oil spillages have occurred through out the world, and there is precedence on how affected communities are dealt with.²² Even without establishing culpability in the grounding of the *Prestige* oil tanker ship in the Galicia coast of northwest Spain, the Spanish authorities made provisions for compensation of all those whose livelihood were tied to fishing in the contaminated coast²². This no doubt would have saved the affected persons from hunger. People affected by oil spillage in Nigeria, at least, deserve food aid, medical assistance, and money to tide them over the lean months created by oil spill. This is the least they expect from the government and the oil companies, especially as they had ceded their rights to this highly priced resource to the Nigerian state.

Conclusion

Crude oil spillage can increase household food insecurity and childhood malnutrition in the affected communities. Efforts should always be made to provide food aid and medical assistances to affected communities, irrespective of the cause of the spillage.

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