INTERNATIONAL CONFERENCE ON AFRICA'S
SUSTAINABLE DEVELOPMENT (ICASuD) 2023

ILLEGAL PETROLEUM REFINING AND HEALTH SECURITY IN RIVERS STATE, NIGERIA

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DOI: https://doi.org/10.5281/zenodo.11203644

Abstract

This work observed illegal petroleum refining and health security in Rivers State. The study aimed to discover the impact of exposure to residues from refining crude oil, from illegal petroleum refining, on the health of individuals. Its objectives were to determine the health challenges associated with illegal petroleum refining and to discover the nexus between health security and illegal petroleum refining. A cross-section survey research design was used to achieve the study's objectives, and structured questionnaires were used to obtain quantitative data. Secondary data came from journal articles and publications. The estimated population of the study amounted to 686,900 and the sample size was derived by the utilization of the standard formula which amounted to 384. The hypotheses were tested using correlation analysis and a descriptive approach to test the relationship between illegal petroleum refining and health security. The study concluded that there are significant health challenges associated with the operations of illegal petroleum refining.

Keywords: Health safety, illegal petroleum refining, crude oil, rivers state, respiratory illness.

1. INTRODUCTION

The increasing operations of illegal petroleum refineries arising from devastated and impoverished locals of communities has intensified health challenges which transcend beyond the vicinity of where such operations are carried out (Onwuna, Stanley, Abu, & Immanuel, 2022). The term illegal petroleum refining(IPR) or artisanal refining pertains to the illicit practices of stealing crude oil and refining it through the utilization of indigenous resources, traditional knowledge, and skills, with minimal or no incorporation of contemporary technology (Oyewole, 2021). This operation result in severe and potentially disastrous outcomes and disregards health security.

Health security can be defined as the proactive and reactive measures needed to mitigate the risk and impact of severe public health events that harm people's health across geographical regions and international boundaries (World Health Organization, 2019). It is evident in the present global world that one of the major public health events that harms people's health is illegal petroleum refining (Sanchez, Knapp, Olalekan, & Nanalok, 2021). Although, the existing body of literature extensively examines the impacts of illegal petroleum refining on the environment and economy of communities, previous studies have provided a limited perspective on the implications of illegal petroleum refining on the health of people, particularly individuals residing in Degema, Ogu-bolo, and Opobo local government areas of Rivers State, Nigeria.

This study examines the following research question: What is the impact of exposure to residues from boiling crude oil, resulting from illegal petroleum refining, on the health of individuals in Rivers State? What is the prevalence of respiratory illness from illegal petroleum refining activities in Rivers State? What is the relationship between illegal petroleum refining and health security in Rivers State.

This paper presents several significant contributions to the existing body of literature. First we explain the correlation between illegal petroleum refining and health security. Second, we examined the legislation and provision of safe and well equipped environment with advance technology for the refining of crude oil locally. The subsequent sections of this paper are structured as follows: the forthcoming section provides a comprehensive analysis of the literature review. Following that, a comprehensive account of the research methodology and subsequent data analysis is provided. Afterwards, the findings and discussion. The final section of this paper provides an overview of the limitations encountered throughout the study and suggests potential avenues for further research.

2. LITERATURE REVIEW

Causes of Increasing Operations of Illegal Crude Oil Refineries

A lot of factors have led to the rise in the operations of illegal crude oil refining in Rivers State and in the Niger Delta as a whole. Despite Nigeria's government operations in addressing the problem of illegal oil refining, principally through the Joint task force, more sites for illegally refining crude oil have sprung up in the region. Bodo, Gimah, & Seomoni, (2020), explains that unemployment and poverty in the area are contributing factors to the rise in the activity of illegal crude oil refining. Despite the wealth of natural riches on their land, the inhabitants of oil rich areas in Rivers State have long complained of government and oil company neglect. The current state of affairs has sparked protests on the ground and provided opportunities for organized crime. The lack of land and rivers for agricultural activities as a result of numerous oil spills from petroleum companies, gas flaring and forest fires has made it necessary for them to find alternate methods of surviving (Ndidi, Bekinbo, & Gbenenee, Jack, 2020). Because a huge number of indigenes do not have access to any sort of employment, they are forced to contend with a dearth of financial resources and a shortage of agricultural goods. The only way to make a living that is both readily available and likely to be sustained is to either tap into or break crude oil pipelines and then refine the oil locally so that they can be sold both inside and outside of the country (O D Efenakpo et al., 2022).

Oyewole (2021), considers marginalization and neglect of the inhabitants of Rivers State as a major factor for the increasing presence of illegal oil refineries in the area. Some in the Niger Delta believe that the region's oil riches is being diverted to the more developed cities of Abuja and Lagos, despite the fact that those in the Niger Delta itself lack access to even the most fundamental of social services. There are some of the world's poorest people living in villages where oil is being explored in Rivers State. Their farmlands and rivers have been severely damaged, and they have no viable means of earning a living (Bodo et al., 2020). As a result, the youths of this region have resulted in taking what they consider theirs due to their dissatisfaction with the conditions in which they live. However, rather than providing a solution, the youths are further damaging the health and environment of the region though benefiting from their operation of illegal crude oil refineries (Onosemuode et al., 2020).

In the view of Ndidi et al., (2020), the scarcity and high price of fuel and kerosene throughout the Niger Delta is a contributing factor to the rise in the operation of illegal oil refineries. The rising cost of petroleum is commonly thought to have stimulated the creation of local markets therefore creating a high demand for

cheap supply of locally refined crude. The proponents of illegal oil refining have contended that their operations have fostered a flourishing economy in the Niger Delta region, owing to the establishment of a sophisticated supply chain. This network encompasses skilled engineers, who affix valves to high-pressure pipelines and subsequently engage in nightly oil syphoning. Additionally, there are boat yards that facilitate the construction and provision of barges to the perpetrators, which are then utilized to transport crude oil across the creeks (Sanchez, Knapp, Olalekan, & Nanalok, 2021).

Illegal Crude Oil Refining in Rivers State, Nigeria

Rivers State is a significant region located in the Northern part of the Niger Delta. Most parts of this state is characterized by a riverine domain (wet land). These wetlands are vital to the survival of the local population, who rely on them for both food and income (Oyewole, 2021). Rivers State, in Nigeria's Niger delta, is a major oil hub. Black soot deposition in the environment has plagued the region for over five years due to the emergence of multiple illegal crude oil refineries in and around. The residents of the area since November 2016 find black soot all over their vehicles, clothing, homes, plants, and more. Up until the first quarter of 2017, soot levels only rose further (Nwozor, Olanrewaju, Ake and Okidu, 2020). According to Emuedo & Emuedo (2014) cited in (Sanchez, et. al, 2021), the activities of illegal crude oil refining is prevalent in Rivers State and has deteriorated the air and water quality which has become unhealthy for human consumption, this has however negatively affected the health of the people.

The Niger Delta region has witnessed the emergence of local technology for petroleum refining in response to the challenges of underdevelopment, poverty, and the escalating cost of refined petroleum products for domestic consumption in Nigeria, particularly in Rivers State. The inhabitants of Rivers State have developed a native method of refining petroleum products utilizing the technology available to them locally (Onakpohor, Fakinle, Sonibare, Oke & Akeredoluet, 2020).

Asuru & Amadi (2016) cited in (Onakpohor et al., 2020) explains that the equipment that are utilized for the functioning of illegal crude oil refining are locally crafted and acquired. These equipment's include, but are not limited to; Pipes, tanks, drilling machines, drums, dried wood, Cotonou boats, fire woods, crude oil, pumping machines, rubber hose and storage facilities, among many other things. Onakpohor et al., (2020), further describes that few people are needed to operate this illegal business efficiently and effectively in a convenient manner. The operation of these illegal crude oil refineries are made easy with low cost of labour available and the abundance of raw materials. In order to acquire their raw material (crude oil), most illegal petroleum refineries in Rivers State engage in the practice of illegal bunkering, in which holes are drilled into a crude oil flow line and taps are placed for the purpose of extracting crude oil in (Sanchez, et. al 2021).

Crude oil refineries in the area have impacted agricultural land and crop production in the surrounding areas. Soil pollution caused by hydrocarbon components has occurred from the transport of crude oil to local crude oil refineries and the refining procedure employed by local crude oil refiners. This has resulted in soil degradation via leaching and erosion. Damage to cropland from hydrocarbon contamination has a significant impact on food security (Oyewole, 2020)**.**

Illegal Oil Refining in Scaling up Health and Environmental Problems in Rivers State

Illegal or artisanal crude oil refineries have escalated health and environmental problems not only in Rivers State but in most parts of the Niger Delta. The activities of these illegal business has had considerable negative impact on both the health of the people as well as the environment (Onwuna et al., 2022).

There is no debate that it is a matter that should be of considerable worry due to reports of its association with a variety of fatal ailments including lung disorders, cancer, heart diseases, respiratory illness and birth-related defects among other types of mortality (Onwuna et al., 2022). Most parts of Rivers State have been engulfed in a thick haze of "strange black soot" from illegal refineries since November of 2016, and the problem has only gotten worse since then. Oriasi, Rowland & Harry (2022), explains that, this is because the illegal refineries are contributing to an already existing problem with gas flares coming from oil fields and petrochemical refineries. In the Niger Delta region of Nigeria and most especially in Rivers State, soot from the combustion of hydrocarbons is now a typical threat to the health of thousands as well as the region's plants, water, soil, and air (Oriasi et al., 2022).

As a direct result of the activities of illegal crude oil refineries in the area, the production of black soot has led to an increase in air pollution, which in turn has been a significant cause of death and morbidity in the area. It is evident that polluted air arises when air contains dangerous substances that are not found in the air's natural components and that are harmful for both human health and the environment. (Natural Resource Defense Council, 2021). There has been a rise in the occurrence of skin infection, difficulty breathing, coughing, and asthma aggravation among the native population of Rivers State. Whyte, Tamuno-wari & Kabari (2021), explains that when these fine soot particles (PM2.5) are inhaled, can go deep into bronchiolar tissue, where they can trigger oxidative stress, pulmonary inflammation, and even damage to the deoxyribonucleic acid (DNA) in cells. Long-term risks include arrhythmias and lung cancer, while short-term effects include irritation of the eyes, nose, and throat, chest tightness, wheezing, dyspnea, and acute exacerbation of asthma.

Illegal crude oil refining in Rivers State has further escalated health and environmental problems by polluting the rivers in the region. According to Bashir, Okareh, Chigor & Igbinosa (2018), the authors elucidates that rivers constitute a significant reservoir of potable water for communities residing in the Niger Delta region who lack access to safe drinking water. Many communities in Rivers State depends on the river for various activities, such as drinking, bathing, cooking, washing of clothes and many more. However, activities associated with the illegal refining of crude oil such as bunkering activities and breaking of underground pipes has contaminated and polluted the river with leftover residue. There have been notable accounts of waterborne illnesses or infections, including but not limited to typhoid, cholera, diarrhea, and shigellosis (Beshiru et al., 2018).

Excessive crude on the environment in Rivers State has blackened the top soil, killing all the nutrients in the soil and so destroying the life of plants. Toxic byproducts of illegal oil refining kills vegetation in the surrounding environment. This, however causes a shortage of food for both consumption and trade, and the resulting destruction of water and food—two necessities for human survival—leaves the locals vulnerable to disease (Bodo et al., 2020).

Unfortunately, accidents at refineries frequently have devastating results, such as fires that claim the lives of people involved in the business. Illegal oil refiners in Rivers State, despite the obvious dangers associated with refining crude oil illegally, still partake in the business, which has resulted in many have losing their lives in the process as a result of explosion. Several reasons, such as the complete neglect of oil-producing villages, extreme poverty, and the lucrative potential of this illegal business, were found to contribute to this phenomenon. In addition, fires started by illicit refineries have destroyed entire neighborhoods in the Niger Delta, claiming countless lives and destroying countless homes (Ndidi et al., 2020)

Theoretical Framework

Resource Curse Theory

The resource curse theory is a very important theory in social science. It is also known as the paradox of plenty or the poverty paradox (Auty, 1993). The phrase "resource curse" was coined by Richard Auty in 1993 to describe the paradoxical phenomenon wherein countries endowed with an abundance of natural resources fail to reap the benefits of their wealth and instead experience slower economic growth than countries that lack such resources (Auty, 1993). It contends that countries with low and middle income levels of development may benefit less from having a favorable natural resource endowment than countries with higher income levels (Stevens, 2015). This has however been the case in Rivers State and in extension Nigeria. Rivers State is endowed with natural resources, with the most attractive being, crude oil. With the abundance of crude oil in the State and the country as a whole, development, economic growth and welfare of the people are the most unfavourable when compared to other countries who have fewer natural resources. The over dependency on Oil in Rivers State and in extension Nigeria has compounded the risk of corruption. When royalties and taxes are paid to the Nigerian government by multinational oil companies, they are typically misappropriated through instances of corruption and fraudulent activities in the public procurement process, with funds frequently being redirected towards the enrichment of influential individuals and political elite, rather than being allocated towards the development of public goods. (Gillies, 2020). This corruption has however led the people of Rivers State to ensure that they benefit from the oil wealth since they are being neglected. As a result, they resort to stealing crude oil and vandalizing oil pipelines in order to obtain crude oil, which they then refine locally and sell in order to make a living(Onyena & Sam, 2020) . However, the illegal refining of crude oil has led to an increase in the number of health problems experienced by Rivers State residents

2. METHODOLOGY

The study adopted the cross-sectional research design in order to investigate the exposure and outcome of the dependent and independent variable, measured at the same point in time (Wang & Cheng, 2020). This research employs a quantitative analysis. The population of the study consists of the entire population of the three selected rural local government areas (LGA's) in Rivers State. They are: Ogu-bolo LGA, Opobo LGA and Degema LGA which has an estimated population of 686,900 (National Population Commission, 2022).

The study adopts the Standard Formula to arrive at a representative sample size .Using the percentage of each Local Governments to determine the copies of questionnaires to be distributed to each of them that is representative enough. Using the Standard formula, the sample size for the population of 686,900 estimated to 384. This study also adopts the simple random sampling techniques. Two major sources of data collection was utilized. They include; Primary method of data collection and secondary method of data collection. The method of data analysis used for the purpose of this study is the correlation analysis.

3. ANALYSIS

In order to infer responses from the study population, a total of 384 questionnaires were systematically distributed. A total of 295 usable questionnaires were collected. Following the field work of the study, it was found that the number of distributed questionnaires in Degema LGA was 157, while in Ogu-bolo and Opobo, the numbers were 46 and 92, respectively.

The analysis of the quantitative data obtained from the questionnaire was conducted using both SPSS version 21 and Microsoft Excel. Responses from the structured questionnaire were subjected to descriptive (frequency and tables) statistics. Descriptive statistics such as tables, percentages, and frequency distribution were used to analyse and present the data. The method of data analysis used for the purpose of this study is the correlation analysis to test the relationship between illegal petroleum refining and health security.

4. DISCUSSION

Impact of exposure to residues from refining crude oil

Specific impact associated with the exposure to residues from illegal petroleum refining on the health of residence of Rivers State as observed from the findings in the study include;

- Respiratory illnesses: As observed from the data obtained from the questionnaire.

The finding draws attention to the harmful effects of illegal petroleum refining on the environment and human health. The significant proportion of participants who reported high levels of exposure indicates that this is a widespread problem among those who participated in the study. It shows that a large number of people are constantly exposed to the hazardous residue released during the unlawful refining of crude oil. The health effects of being exposed to residues from illegal petroleum refining and its by-products are extremely dangerous. Hazardous pollutants, such as volatile organic compounds, heavy metals, and other toxic chemicals, are often released during the process of illegally refining crude oil, posing threats to human health. Prolonged or frequent exposure to these substances may lead to a range of health challenges and complications (Ndidi et al., 2020) .

- Cough: Another significant impact of exposure to residues from illegal petroleum refining on the health of residents of Rivers State is cough. The most prevalent health issue reported was cough, with 64 respondents (21.7%) indicating its presence. Exposure to residues from illegal petroleum refining can indeed lead to various health issues, including coughing. When individuals are exposed to these toxic residues, either through inhalation or direct contact, it can irritate the respiratory system and lead to respiratory symptoms such as coughing (Beshiru et al., 2018).The presence of toxic compounds has the potential to cause irritation to the mucous membranes that line the respiratory tract, including the nasal cavity, the throat, and lungs. This irritation can lead to irritation and the triggering a cough reflex. Coughing is an innate biological response of the human body aimed at eliminating foreign particles, mucus, or irritants from the respiratory tract (Whyte, Tamuno-wari & Kabari, 2021). Chest pain may occasionally result from persistent or intense coughing. The act of coughing can potentially result in muscular strains in the chest and abdominal regions, thereby inducing sensations of discomfort or pain (Oriasi et al., 2022). Furthermore, prolonged coughing can induce inflammation and irritation within the airways and lung. The inflammatory response can spread to the surrounding tissues and chest wall, resulting in chest pain or uneasiness

- Birth related defects: Exposure to residues from illegal petroleum refining can have various adverse effects on human health, including birth-related defects. Exposure to these residues, particularly among pregnant women, through inhalation, ingestion, or skin absorption, can result in the entry of toxic substances into their bloodstream, which may traverse the placenta and potentially impact the growth and development of the foetus (Bebeteidoh et al., 2020). The mechanisms by which these substances lead to birth-related defects includes;

a. Developmental toxicity: Several of the toxic compounds present in petroleum residues are recognized to exhibit developmental toxicity, thereby impeding the regular growth and maturation of the foetus. The presence of interference has the potential to cause disruption in essential biological processes, resulting in structural anomalies or functional limitations in multiple organ systems (Sanchez, et. al, 2021),

b. DNA damage: Certain chemical compounds found in petroleum residues, namely polycyclic aromatic hydrocarbons (PAHs), possess the capability to induce harm to DNA. The occurrence of DNA damage during foetal development has the potential to induce genetic changes or alterations that could heighten the likelihood of birth defects (Ndidi et al., 2020).

c. Endocrine disruption: Several compounds present in petroleum residues, such as certain Polycyclic Aromatic Hydrocarbons (PAHs) and Volatile Organic Compounds (VOCs), have the potential to function as endocrine disruptors. The presence of these chemicals may potentially impede the hormonal signalling mechanisms responsible for the regulation of foetal development, resulting in disturbances in the structure and operation of organs and tissues (Beshiru et al., 2018).

d. Oxidative stress: The human body may experience oxidative stress as a result of exposure to toxic substances found in petroleum residues. An imbalance between the creation of potentially hazardous reactive oxygen species and the body's ability to eliminate those species leads to oxidative stress (Oyewole, 2018). Exposure to residues may result in cellular harm and hinder normal developmental processes during pregnancy.

Prevalence of Respiratory Illness and other Health Challenges among People Living in Rivers State

A majority of the respondents alluded to the fact that the activities of illegal petroleum refining has resulted in the prevalence of this health challenge. Based on the data gotten from the study, some of the respiratory illnesses mentioned by the respondents include:

- Asthma
- Influenza such as cough and sore throat
- Lungs disorder such as (chronic obstructive pulmonary disease (also known as COPD), lung cancer, and pulmonary fibrosis)
- Stuffy or runny nose
- Breathing problem such as (wheezing, trouble breathing adequately, or shortness of breath)

The presence of cough and asthma as key indicators of health challenges in the study aligns with the known adverse effects of exposure to toxic substances released during the illegal petroleum refining process. The act of breathing in these substances has the potential to cause irritation to the respiratory system, which can result in coughing and the worsening of pre-existing respiratory ailments, such as asthma. These findings emphasize the tremendous burden illegal petroleum refining activities place on people living in such areas, especially in terms of respiratory health.

The Nexus between Illegal Petroleum Refining and Health Security in Rivers State

The correlation test conducted reported a significant relationship between illegal petroleum refining and health security. When illegal petroleum refining increases in the region, the analysis suggests that health security tends to decrease. This implies that as the incidence of illegal petroleum refining activities rises, it

has a detrimental effect on the overall health security situation in Rivers State. On the other hand, when illegal petroleum refining decreases, the analysis suggests that health security tends to improve.

5. CONCLUSION AND IMPLICATIONS

To conclude, the act of illegally refining petroleum presents considerable hazards to public health security, affecting not only those engaged in the unlawful practice but also the inhabitants of nearby refining locations. Empirical investigations and scholarly inquiries have illuminated the environmental implications of illegal refining, encompassing atmospheric and aquatic contamination, soil deterioration, and ecological harm. illegal petroleum refining emit harmful pollutants that possess the potential to cause adverse health effects, including but not limited to respiratory ailments, skin disorders, and cancer.

Based on the established relationship between illegal petroleum refining and health security, it is recommended that illegal petroleum refining calls for a multifaceted strategy that includes law enforcement, regulatory controls, community involvement, and public health initiatives. Together, these organizations can lessen the practice of illegal petroleum refining, help build a safer and more comfortable atmosphere, and improve the health security. Also, by harnessing the knowledge and expertise of the locals, the Nigerian Government can create employment opportunities, thus reducing unemployment rates and improving the overall economy. Moreover, refining crude oil locally can promote a safer environment by implementing stringent quality control measures and reducing the risk associated with transporting crude oil over long distances. This approach can help prevent accidents, oil spill and other environmental hazards, ensuring the protection of local ecosystem and communities.

6. LIMITATIONS AND FURTHER STUDIES

This research is not free from limitation. The study focuses majorly on Degema, Opobo and Ogu-bolo local government areas in Rivers State, leaving other LGA's where illegal petroleum refining occurs. The study also focuses on the impact of illegal petroleum refining on health security, and does not focus on other areas such as its impact on the economy of the State, the multinational petroleum companies, and its impact on climate change. Lastly, the study focuses only on Rivers State.

The following suggestions for future studies is drawn from the limitation of the study. Further studies can focus on other LGA's in Rives State where illegal petroleum refining is being carried out .The impact of illegal petroleum refining on other areas can be observed for future studies. Also, other states where Illegal petroleum refining is being practiced can inform the basis of further studies.

AUTHOR DECLARATIONS

Author Contributions: Conceptualization, Pokubo I.E; methodology, Oladoyin A.M; software, Pokubo I.E; validation, Oladoyin, A.M; formal analysis, Pokubo I.E; investigation, Pokubo I.E; resources, Pokubo I.E; data curation, Pokubo I.E; writing—original draft preparation, Pokubo I.E; writing—review and editing, Oladoyin A.M.; funding acquisition, None. All authors have read and agreed to the published version of the manuscript.

Funding: No funding was received in the cause of this research

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data utilized for this study will be made available upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

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