Short Communication

Black Soot: A Threat to the Environment and Population's Health in Rivers State Nigeria

[1]GA Owhor, [1]CR Chigbo, [1]GC Iwendi, [2]IO Ogunkola, [3]O Germanos, [4]R Ateb, [5]BI Uba
[1]Faculty of Pharmacy, University of Port Harcourt, Choba, Nigeria.
[2]Department of Public Health, University of Calabar, Calabar, Nigeria.
[3]Medical School of University of Cyprus.
[4]Faculty of Pharmacy, University of Calabar, Calabar, Nigeria.
[5]Faculty of Pharmacy, University of Benin, Edo State, Nigeria.
Corresponding author: Greatman Adiela Owhor, *Faculty of Pharmacy, University of Port Harcourt, Choba, Nigeria; Greatmanadiela@gmail.com; +2347049708712*

Article history: Received 2 December 2022, Reviewed 7 December 2022, Accepted for publication 14 December 2022, Published 07 March 2023

Abstract
Air pollution is harmful to the environment and the habiting population. Rivers state is not new to this as Black Soot continues to accumulate in the air and exert unpleasant effects on the environment and the health of occupants of the state. The soot has caused deteriorating effects on the aesthetics of the environment, affecting both soil and water bodies, disrupting agricultural practices and contributing to climate change. Population health has also not been spared, with the increased presence of carcinogenic elements in the atmosphere, alongside an increased risk for respiratory diseases such as bronchitis and asthma. There is a need for proper documentation of black soot events in Rivers State. New policies should be created and adopted to reduce its formation. Mass media activity to enlighten the public on the threats of Black Soot is needed. Preventive measures that can be effective in curbing the situation should be provided.

Keywords: Black soot, environment, health, Rivers state, Nigeria

Introduction
Climate change has been a continuous and constant phenomenal process. It is hypothesized that human activities (majorly polluting the environment) have reached a point where we are fashioning global climate change. A notable pollution that is contributing to global climate change is air pollution. Air pollution kills an estimated 7 million people worldwide every year. Ambient air pollution accounts for an estimated 4.2 million deaths annually due to stroke, heart disease, lung cancer, acute and chronic respiratory diseases.[1]

The residents of Rivers State, one of the oil-producing states found in the Niger Delta have been experiencing air pollution in its environment from constant soot emissions since the last quarter of 2016. It is considered an environmental health threat to this region.[2] Black carbon, also referred to as soot, is emitted during the incomplete combustion of fossil fuels, biofuels or wood. Soot is an air pollutant that is a slightly sticky fine black or brown powder which is a product of incomplete combustion. The petroleum industry constitutes a source of air pollution in the Niger Delta region of the country. From here, production operations, such as gas flaring and venting, oil and condensate spills, and transportation are the sources of pollutants.[2] Other sources include power plants, and heavy industrial equipment, including boilers, burners, coolants, and separators.[2, 3]

The effect of black carbon on the environment and the climate are documented in several literatures; most are not specific to Rivers State. This article describes the impact of black soot/black carbon on climate change and its implication on the population's health in Rivers State.

Environmental Implications of Black Soot Pollution in Rivers State
Some schools of thought suggest that there are associations between the emission of soot and artisanal refining, the burning of illegal refineries within the region indicates that law enforcement agents have seized and burnt illegal refineries. According to reports, some residents considered the action unethical, arguing that it

Print ISSN: 0189-9287

amounts to a pollution equivalent of 10 to 20 incinerated tanker loads of crude.[4, 5]

Soot can cause haze (it occurs when sunlight interacts with particles in the atmosphere). It can in turn impact negatively on nature's beauty. Environmentally, it disrupts the tourism potential, leading to economic problems related to revenue generation.[6] Some compounds from soot such as nitrogen and sulfur dioxides can form acidified precipitates. They are collected in the soil or water and has caused degradation of the soil minerals and the death of aquatic animals and river basin.[6] Organizations such as the Environmental Pollution Agency and Environmental Management System are beginning to act to reduce the soot limit by up to 20 per cent and emission reductions from vehicles, engines and power plants.[6]

Black carbon can have significant direct and indirect impacts on the climate and agricultural practices if not handled. Soot is shown to increase premature death rates (reduce life expectancy). An increase in air pollution will exacerbate diseases such as heart attacks, acute respiratory infections (ARI) such as acute bronchitis, aggravated asthma.[7, 8]

Health Implications of Black Soot Pollution in Rivers State

Black soot just like most air pollutants is released more rapidly into the atmosphere than it can be absorbed. Their continuous presence in the atmosphere poses serious harm to the health of the habiting population.[7] The nature of soot particles allows for easy penetration into the body's tissues, resulting in respiratory diseases such as asthma, skin disorders, reproductive problems, and heart diseases.[7, 10] Evidence has confirmed the high concentrations of heavy metals such as Lead and Cadmium in regions with soot prevalence. An experiment was conducted on soot samples in Port Harcourt, these samples were evaluated for their metal content and were found to contain different heavy metals.[9] These metals were classified by the International Agency for Research on Cancer (IARC) as carcinogenic substances. Continuous exposures to these elements are studied to have established relationships with lung, liver, kidney and nasal cancers.[8, 9]

The nature of soot particles allows for easy penetration into the body's tissues, resulting in respiratory diseases such as asthma, skin disorders, reproductive problems, and heart diseases.[10] With a steady rise in soot concentrations, there's an increased general health risk alongside it. Without a fast and efficient method of black soot prevention, the resultant future projection would include a surge in respiratory diseases, increased mortality rate, increased cost of healthcare spending among residents, and the dominance of a harmful environment.[7, 10]

Conclusion and Recommendations

The effect of black carbon on the environment draws significant attention because it harms both the climate and the health of the population. Manufactured causes of air pollution must be addressed as a fundamental step towards soot eradication. The issue of black soot pollution must be solved using a combination of government policies and strict enforcement and monitoring agencies to keep concerned industries in check. Industries that pollute the environment with petroleum waste products should be penalized. The polluter pays principle should be employed by the government. The issue of climate changes due to soot in Rivers State and generally in Nigeria is not well-documented, so effort must be made beyond the relevant policies and climate change literature.

Also, there is a need to intensify research projects that would create an evidence base on the negative impact of black soot in the southern region of Nigeria. Such projects will help formulate effective government policies from the point of the felt need of the community concerned and not merely a perceived need. There is a need to create public awareness and health education to help the populace imbibe preventive measures to stay healthy amidst the pollution.

Authors Contribution: G.A.O, C.R.C, G.C.I and I.O.O wrote the main manuscript text. O.G, and D.E.L conducted proofreading, and all authors reviewed the manuscript.

Competing interests: The authors declare that there are no competing interests

Funding: None

References

1. World Health Organization (WHO). WHO Releases Country Estimates on Air Pollution Exposure and Health Impact. Available online: http://www.who.int/mediacentre/news/releases/2016/air-pollution-estimates/en/. Assessed on 19 June 2022.
2. Fagbeja, M.A.; Hill, J.; Chatterton, T.; Longhurst, J.; Akinyede, J. Residential-Source Emission Inventory for the Niger Delta—A Methodological Approach. J. Sustain. Dev. 2013, 6, 98–120.

Print ISSN: 0189-9287

3. Ede, P.N. Pollution and the Rivers State Environment. Niger. Res. Rev. 1998, 1, 81–89
4. The Guardian. Air Pollution: Rivers Resident Decry Invasion by Black Soot. Available online:https://guardian.ng/sunday-magazine/air-pollution-rivers-resident-decry-invasion-by-black-soot/
5. Sweet Crude. Nigeria: Cancer-Causing Black Soot Assail Port Harcourt, Residents Panic. Available online: http://sweetcrudereports.com/2017/02/11/nigeria-cancer-causing-black-soot-assailport-harcourt-residents-panic/
6. Orji Sunday. Black soot still plagues the residents of the Niger Delta City Monitor 2020, available at https://citymonitor.ai/environment/pollution/black-soot-still-plagues-the-residents-of-the-niger-delta
7. Donald McCubbin, "Health Benefits of Alternative PM2.5 Standards" (Washington: American Lung Association, Clean Air Task Force, Earthjustice). 2011. Available at https://www.earthjustice/sites/default/files/Health-Benefits-Alternative-PM2.5Standards.pdf
8. Ihesinachi A.K, Amalo N. Dibofori-Orji, Ozioma AE. Exposure to Heavy Metals in Soot samples and Cancer Risk Assessment in Port Harcourt, Nigeria. 2019; 9(24). doi.org/10.5696/2156-9614-9.24.191211
9. Arsenic, metals, fibres and dust: IARC monographs on the evaluation of carcinogenic risks to humans. Vok 100 C; a review of human carcinogens. Lyon, France International Agency for Research on Cancer. 2012. 527
10. Obiorah, Christopher and Abu, Emmy. Breast Cancer in Rivers State Nigeria: Ten-year review of the Port Harcourt Cancer Registry. South African Journal of Oncology. 2019; 3(0). a58. https://doi.org/10.4102/sajo.v3i0.58

Print ISSN: 0189-9287