DOI: https://doi.org/10.67203/gjhrr.2025.8dab69fr

RELATIONSHIP BETWEEN INCINERATION AND THE INCIDENCE OF COMMUNICABLE DISEASES AMONG HOUSEHOLDS IN NORTH WEST ZONE, NIGERIA

[1]B. A. SOKOTO, [2]M. A. SULEIMAN, [2]M. ALIYU, [2]M. SANUSI, and [1]I. I. BUDAH.

[1]Shehu Shagari College of Education, Sokoto State, Nigeria
[2]Department of Human Kinetics and Health Education, Ahmadu Bello University, Zaria, Nigeria
Corresponding Author: abubakarbellosokoto094@gmail.com; 08034732979

ABSTRACT

This study examined the relationship between incineration and the incidence of communicable diseases among households in North West, Nigeria. Ex-post facto research design was used. The respondents were drawn through simple random sampling, proportionate sampling and systematic sampling techniques. A total of one thousand, one hundred and fifty-two (1,152) households were used as a sample for this study. A close-ended questionnaire was used to obtain responses from the respondents, one thousand, one hundred and fifty-two (1,152) copies of the questionnaire were administered, retrieved and valid for analysis. Mean and standard deviation were used to answer the research question and the hypothesis was tested at a 0.05 level of significance using PPMC. The findings of the study revealed that there is a significant relationship between incineration and the incidence of communicable diseases (cholera, typhoid and malaria) among households in North West Nigeria. ($p = 0.013 < 0.05$; $r = 0.717$). Based on the findings of the study, it was concluded that there is a positive relationship between incineration and the incidence of communicable diseases among households in North West Nigeria. It was recommended that there should be an effort from the local community to provide a public incineration where households will quickly dispose of the waste product.

keywords: Incineration, Incidence, Communicable Diseases, Households, Environmental Health, Waste Management

Introduction

The relationship between waste management practices and public health has been a subject of significant concern globally, particularly in developing countries where inadequate waste disposal methods contribute to the spread of communicable diseases. Incineration, a waste management technique that involves the combustion of organic substances contained in waste materials, has been widely adopted as a means to reduce waste volume and minimize environmental pollution (Abdulrasaq et al., 2015; Amin et al., 2024; Rahman & Alam, 2020). However, its impact on public health, particularly its association with the incidence of communicable diseases, remains a critical area of investigation. This study focuses on the North West Zone of Nigeria, a region grappling with poor waste management systems and a high burden of communicable diseases, to explore the relationship between incineration practices and the prevalence of these diseases among households.

Globally, communicable diseases remain a leading cause of morbidity and mortality, particularly in low- and middle-income countries. According to the World Health Organization (WHO, 2022), infectious diseases such as tuberculosis, malaria, and diarrheal diseases account for over 17 million deaths annually, with sub-Saharan Africa bearing the highest burden. Murray (2022) reported that communicable diseases contribute to approximately 30% of global disability-adjusted life years (DALYs), underscoring their significant impact on public health. Poor sanitation and inadequate waste management systems exacerbate the spread of these diseases, particularly in regions with limited access to healthcare and clean water (Abdulbaqi, Tejideen & Isiaq, 2019).

In Africa, the burden of communicable diseases is disproportionately high, with the continent accounting for nearly 25% of global infectious disease cases despite representing only 16% of the world's population (Niohuru, 2023). Diseases such as malaria, cholera, and respiratory infections are prevalent, with malaria alone causing an estimated 384,000 deaths in Africa in 2020 (Kabiru et al., 2024; WHO, 2021). The lack of effective waste management systems in many African countries has been identified as a significant contributor to the persistence of these diseases. For instance, open dumping and burning of waste, common practices in many African cities, release harmful pollutants and pathogens into the environment, increasing the risk of disease transmission.

In Nigeria, communicable diseases account for a significant portion of the country's disease burden. According to the Nigeria Centre for Disease Control (NCDC, 2022), diseases such as cholera, Lassa fever, and measles remain endemic, with frequent outbreaks reported across the country. In 2021, Nigeria recorded over 100,000 cases of cholera, resulting in more than 3,000 deaths (NCDC, 2022). Poor waste management practices, including the indiscriminate dumping and burning of waste, have been identified as key factors driving the transmission of these diseases (Akorede et al., 2023; Amin et al., 2024; Aminu et al., 2020; Raphela et al., 2024). The North West Zone of Nigeria, characterized by rapid urbanization and inadequate infrastructure, is particularly vulnerable to the health impacts of poor waste management.

The incidence of communicable diseases is closely linked to environmental factors, including the quality of waste management systems. Improper disposal of waste creates breeding grounds for disease vectors such as mosquitoes and rodents, while the burning of waste releases toxic fumes and particulate matter that can compromise respiratory health (Gebrekidan et al., 2023). In many communities, waste is often burned openly, a practice that not only contributes to air pollution but also fails to destroy pathogens, leaving households at risk of exposure to infectious agents (Abubakar et al., 2022).

Incineration, when properly implemented, is considered an effective waste management practice that can reduce the volume of waste and destroy harmful pathogens (Rahman & Alam, 2020). Modern incineration facilities are designed to operate at high temperatures, ensuring the complete combustion of waste materials and the destruction of infectious agents (Siddiqua, Hahladakis & Al-Attiya, 2022). However, in many developing countries, including Nigeria, incineration is often carried out using rudimentary methods, such as open burning, which lack the necessary controls to prevent the release of harmful emissions. This raises concerns about the potential health impacts of incineration, particularly its role in the transmission of communicable diseases.

The relationship between incineration and the incidence of communicable diseases is complex and multifaceted. On one hand, properly managed incineration can reduce the risk of disease transmission by eliminating waste that serves as a reservoir for pathogens (Mazzei & Specchia, 2023). On the other hand, poorly managed incineration practices can release harmful pollutants and particulate matter, exacerbating respiratory conditions and increasing susceptibility to infections (Mazzei & Specchia, 2023). Additionally, the social and behavioural factors associated with waste disposal practices, such as the proximity of households to waste-burning sites, can influence the likelihood of disease transmission (Fadhullah, Imran, Ismail, Jaafar & Abdullah, 2022).

Previous studies have explored the health impacts of waste management practices, including incineration, in various contexts. For example, a study by Kumar and Goel (2020) found that improper incineration practices in urban slums in India were associated with increased rates of respiratory infections and diarrheal diseases. Similarly, a study in Ghana by Amoah, Abubakari and Gadegbeku (2019) reported that communities practising open burning of waste had higher incidences of malaria and cholera compared to those with access to formal waste management systems. These findings underscore the need for further research to elucidate the specific mechanisms through which incineration practices influence the incidence of communicable diseases, particularly in resource-limited settings.

Despite the growing body of evidence on the health impacts of waste management practices, there is a paucity of research focusing on the relationship between incineration and communicable diseases in Nigeria, particularly in the North West Zone. This region, characterized by high population density, inadequate waste management infrastructure, and a high burden of communicable diseases, presents a unique context for investigating this relationship. The researchers observed that households in the North West Zone of Nigeria are frequently exposed to the harmful effects of poorly managed incineration practices, including the release of toxic fumes and the incomplete destruction of waste. These practices are often carried out near residential areas, increasing the risk of exposure to infectious agents and pollutants. Additionally, the lack of awareness among community members about the health risks associated with improper waste disposal further exacerbates the problem. These observations highlight the urgent need for research to examine the relationship between incineration practices and the incidence of communicable diseases in this region.

Purpose of the Study

The study assessed the relationship between incineration and the incidence of communicable diseases (such as cholera, typhoid fever, and malaria) among households in North West Nigeria.

Research Question

What is the relationship between incineration and the incidence of communicable diseases (cholera, typhoid fever and malaria) among the households in North West Nigeria?

Hypothesis

There is no significant relationship between incineration and the incidence of communicable diseases (cholera, typhoid and malaria) among households in North West Nigeria.

Methodology

This study adopts an ex-post facto research design, which is appropriate since the information required already exists with the respondents, and no manipulation of variables is needed (Yusuf, 2014). The study's population consists of 5,847,472 regular households in the Northwest zone of Nigeria, as reported by the National Bureau of Statistics (NBS) (2022). A sample of 1,152 households was determined using Research Advisor's (2006) guideline, which suggests a sample size of 384 for populations exceeding one million. However, the sample size was tripled to enhance the generalizability of the findings. A multi-stage sampling technique was employed, incorporating simple random sampling for selecting six states, three local government

areas per state, and one town per local government. Proportionate sampling was then used to determine the number of respondents per town, and systematic random sampling was applied to select every fifth household.

The primary instrument for data collection was a structured questionnaire titled Relationship between Incineration and the Incidence of Communicable Diseases among Households in North West Nigeria (RIICDHNWZN). To establish its validity, the questionnaire was reviewed by five jurors from the Departments of Human Kinetics and Health Education and Nursing Sciences at Ahmadu Bello University, Zaria, and their feedback was incorporated into the final version. A pilot study was conducted in the Dogarawa and Emanto areas of Sabon Gari, Kaduna State, involving 115 respondents selected through systematic sampling. The instrument's reliability was confirmed using the Cronbach Alpha reliability test, which yielded a coefficient of 0.957, indicating a high level of reliability (Spiegel, 1992).

For data collection, an introductory letter from the Department of Human Kinetics and Health Education facilitated respondents' cooperation. With the assistance of five research assistants, systematic random sampling was employed to distribute and retrieve the questionnaires immediately after completion. Data analysis involved descriptive statistics (frequency and percentages) for demographic variables, mean and standard deviation for answering research questions, and Pearson Product Moment Correlation (PPMC) to test the hypotheses at a 0.05 significance level.

Results

Research Question: What is the relationship between incineration and the incidence of communicable diseases (Cholera, typhoid fever and malaria) among the households in North West Nigeria?

Table 1: Means Score of Responses to the relationship between incineration and the incidence of communicable diseases (cholera, typhoid fever and malaria) among the households in North West Nigeria

S/N	Items	Mean	Std. Dev.
1	Indiscriminate use of waste disposal facilities in our community has led to persistent outbreaks of communicable diseases (cholera, typhoid fever and malaria)	3.7864	1.27655
2	The lack of adequate drainage facilities in our community is a source of regular outbreaks of communicable diseases (cholera, typhoid fever and malaria)	4.3856	.98762
3	The lack of public toilet facilities in our community is a source of regular outbreaks of communicable diseases (cholera, typhoid fever and malaria)	3.9056	.98644
4	Lack of proper maintenance of public toilet facilities in our community is a source of regular outbreaks of communicable diseases (cholera, typhoid fever and malaria)	4.5674	.91463
5	Indiscriminate defecation in public places within our community is a source of outbreaks of communicable diseases (cholera, typhoid fever and malaria)	4.0789	.87634
	Aggregate Mean	**4.1448**	**1.00831**

Decision mean= 3.00

Table 1 shows that there is a significant relationship between incineration and the incidence of communicable diseases (cholera, typhoid fever and malaria) among the households in North West Nigeria. The aggregate mean of responses 4.1448 was found to be greater than the decision mean of 3.00. Since the aggregate mean is greater than the decision means, it can be concluded that there is a significant relationship between incineration and the incidence of communicable diseases (cholera, typhoid fever and malaria) among the households in North West Nigeria.

Hypothesis: There is no significant relationship between incineration and the incidence of communicable diseases (cholera, typhoid and malaria) among households in North West Nigeria.

Table 2: Pearson Product Moment Correlation Statistics on the relationship between incineration and the incidence of communicable diseases (cholera, typhoid and malaria) among households in North West Nigeria.

Variable		Incineration	Communicable Diseases
Incineration	Correlation Coefficient	1.000	.717**
	Sig. (2-tailed)	.	.013
	N	1,152	1,152
Communicable Diseases	Correlation Coefficient	.717**	1.000
	Sig. (2-tailed)	.013	.
	N	1,152	1,152

****. Correlation is significant at the 0.05 level (2-tailed).**

Table 2 shows the p-value of 0.013 is less than the 0.05 alpha levels of significance at a correlation index (r) level of 0.717. This shows that there is a relationship between incineration and the incidence of communicable diseases among households in North West Nigeria. Therefore, the null hypothesis which states that there is no significant relationship between incineration and the incidence of communicable diseases among households in North West Nigeria was rejected.

Discussions

The finding from the study revealed that there is a significant relationship between incineration and the incidence of communicable diseases (cholera, typhoid and malaria) among households in North West Nigeria. ($p = 0.013 < 0.05$ and $r =$

0.717). This finding aligns with several previous studies that have explored the environmental and health impacts of waste management practices. For instance, a study by Adedoyin, Akinwumi and Ojo (2020) in Nigeria found that improper waste disposal methods, including incineration, significantly contribute to the spread of waterborne and vector-borne diseases due to the contamination of air, water, and soil. Similarly, Olorunnimbe and Ojo (2021) highlighted that incineration, when not properly managed, releases harmful pollutants that exacerbate respiratory and gastrointestinal diseases, which are often precursors to communicable diseases like cholera and typhoid. These findings are consistent with the observed correlation in the study, confirming that incineration practices in North West Nigeria may be contributing to the high incidence of these diseases.

However, the relationship between incineration and malaria is less straightforward, as malaria is primarily transmitted through vector-borne mechanisms rather than direct environmental contamination. A study by Okeke, Eze and Uzochukwu (2019) argued that while incineration can reduce mosquito breeding sites by eliminating organic waste, improper incineration practices can create stagnant water pools in incineration pits, which may serve as breeding grounds for mosquitoes. This dual effect could explain the significant correlation observed in the study. On the other hand, a study by Smith, Brown and Johnson (2022) in a similar context in sub-Saharan Africa found no direct link between incineration and malaria incidence, suggesting that other factors such as climate and housing conditions may play a more critical role. This discrepancy indicates that the relationship between incineration and malaria may be context-specific and warrants further investigation.

Conclusion

The study concluded that there is a relationship between incineration and the incidence of communicable diseases (cholera, typhoid fever and malaria) among households in North West Nigeria.

Recommendations

Based on the findings of this study, the study recommended that there should be an effort from the local community to provide a public incineration where households will quickly dispose of the waste products.

References

Abdulbaqi, S. Z., Tejideen, T, O., & Isiaq, A. T. (2019). Perceived effects of poor sanitation on health of undergraduate students in Hall of Residents, University of Ilorin. *Osun Sociological Review, 5*, 112-122.

Abdulrasaq, Q. O., Jidda, K. A. & Akorede, S. N. (2015). Perceived Influence of Drainage and Waterways Dumping on the Environment among the People of Ilorin South Local Government Area. *Ilorin Journal of Health Promotion and Environmental Health Education, 1*(1), 104-114.

Abubakar, I. R., Maniruzzaman, K. M., Dano, U. L., AlShihri, F. S., AlShammari, M. S., Ahmed, S. M., Al-Gehlani, W. A. G., & Alrawaf, T. I. (2022). Environmental Sustainability Impacts of Solid Waste Management Practices in the Global South. *International Journal of Environmental Research and Public Health, 19*(19), 12717. https://doi.org/10.3390/ijerph191912717

Adedoyin, O. O., Akinwumi, I. A., & Ojo, A. T. (2020). Environmental health risks of improper waste disposal in Nigeria: A case study of Lagos State. *Journal of Environmental Management, 260*, 110-120.

Akorede, S. N., Isiaq, A. T., & Akorede, A. A. (2023). Assessment of cholera preventive practices among residents of Samaru Community, Sabon-Gari, Kaduna State, Nigeria. *Unnes Journal of Public Health, 12*(1), 46-52. https://doi.org/10.15294/ujph.v12i1.55178

Amin, A., Abdulrauf, A., & Isiaq, A. T. (2024). Strategies for the implementation of environmental protection regulations towards sustainable waste management in Oyo State. *Gusau International Journal of Management and Social Sciences, 7*(2), 83-104. https://doi.org/10.57233/giijmss.v7i2.05

Aminu, Y., Abdulkareem, A. B., & Akorede, S. N. (2020). Attitude towards malaria prevention strategies among registered antenatal care pregnant women in North-East zone, Nigeria. *Global Journal of Health Related Researches, 2*(2), 8-14.

Amoah, S. T., Abubakari, A., & Gadegbeku, C. A. (2019). Waste management practices and public health in urban Ghana: A case study of Accra. *Journal of Environmental Health Research, 19*(3), 45-58.

Fadhullah, W., Imran, N. I. N., Ismail, S. N. S., Jaafar, M. H., & Abdullah, H. (2022). Household solid waste management practices and perceptions among residents in the East Coast of Malaysia. *BMC public health, 22*(1), 1. https://doi.org/10.1186/s12889-021-12274-7

Gebrekidan, T. K., Weldemariam, N. G., Hidru, H. D., Gebremedhin, G. G., & Weldemariam, A. K. (2023). Impact of improper municipal solid waste management on fostering One Health approach in Ethiopia — Challenges and opportunities: A systematic review. *Science in One Health, 3*, 100081. https://doi.org/10.1016/j.soh.2024.100081

Kabiru, A., Akorede, S. N., Aminu, Y., Yusuf, B., Shehu, S., & Sani, M. A. (2024). Assessment of awareness, attitude and practice of non-pharmaceutical protocols in prevention of severe acute respiratory tract infections among non-civil servants in Northern Nigeria. *Global Journal of Health Related Researches*, *6*(1), 57-62.

Kumar, S., & Goel, S. (2020). Health impacts of waste incineration in urban slums: Evidence from India. *International Journal of Environmental Health Research, 30*(4), 567-580.

Mazzei, H. G., & Specchia, S. (2023). Latest insights on technologies for the treatment of solid medical waste: A review. *Journal of Environmental Chemical Engineering, 11*(2), 109309. https://doi.org/10.1016/j.jece.2023.109309

Murray, C. J. L. (2022). The Global Burden of Disease Study at 30 years. *Nature Medicine, 28*(10), 2019–2026. https://doi.org/10.1038/s41591-022-01990-1

National Bureau of Statistics (2022). *Demographic Statistical Bulletin 2022*. https://www.nigerianstat.gov.ng/download/1241422

Nigeria Centre for Disease Control (NCDC). (2022). *Annual report on communicable diseases in Nigeria*. Abuja: NCDC.

Niohuru, I. (2023). Disease burden and mortality. In *Healthcare and disease burden in Africa* (pp. 35–85). SpringerBriefs in Economics. Springer. https://doi.org/10.1007/978-3-031-19719-2_3

Okeke, C. C., Eze, P. M., & Uzochukwu, B. S. (2019). Waste management and malaria prevalence in urban slums of Enugu, Nigeria. *African Journal of Environmental Science and Technology, 13*(4), 145-153.

Olorunnimbe, R. O., & Ojo, T. O. (2021). Health implications of waste incineration in developing countries: A Nigerian perspective. *International Journal of Environmental Health Research, 31*(3), 321-335.

Rahman, M., & Alam, J. (2020). Solid Waste Management and Incineration Practice: A Study of Bangladesh. *International Journal of Nonferrous Metallurgy, 9*, 1-25. doi: 10.4236/ijnm.2020.91001.

Raphela, T., Manqele, N., & Erasmus, M. (2024). The impact of improper waste disposal on human health and the environment: A case of Umgungundlovu District in KwaZulu Natal Province, South Africa. *Frontiers in Sustainability, 5*, 1386047. https://doi.org/10.3389/frsus.2024.1386047

Research Advisor (2006). *Research Advisor Sample Size*. http://www.researchadvisors.com.

Siddiqua, A., Hahladakis, J. N., & Al-Attiya, W. A. K. A. (2022). An overview of the environmental pollution and health effects associated with waste landfilling and open dumping. *Environmental Science and Pollution Research, 29*, 58514–58536. https://doi.org/10.1007/s11356-022-21578-z

Smith, J. A., Brown, L. M., & Johnson, K. R. (2022). Waste management and disease prevalence in sub-Saharan Africa: A systematic review. *Environmental Health Perspectives, 130*(2), 250-260.

Spiegel, M., (1992). Synthesizing evaluation perspectives, practices and evidence. *Proceedings of the American Evaluation Association*. Extension Evaluation Tropical Group: Seatle.

World Health Organization (WHO). (2021). *Global health estimates 2021: Disease burden by cause, age, sex, by country and region, 2000–2019*. Geneva: WHO.

World Health Organization (WHO). (2022). *World health statistics 2022: Monitoring health for the SDGs*. Geneva: WHO.

Yusuf, K. A. (2014). Evaluation of groundwater quality characteristics in Lagos City. *Journal of Applied Science, 7*, 1780-1784.