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AN EVALUATION OF THE IMPACT OF COMPOST WASTE ON PUBLIC HEALTH IN MAJOR CITIES IN NIGERIA: INVESTIGATING THE MITIGATING STRATEGIES FOR A HEALTHY SOCIETY

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ABSTRACT

The rapid urbanization and population growth in major cities across Nigeria have led to an increased generation of waste, particularly organic waste, including compostable materials. This waste, when improperly managed, can have severe implications for public health in major cities in Nigeria. This study investigates the impact of compost waste on public health in major Nigerian cities. It examines how the accumulation and improper disposal of compostable organic waste can lead to environmental and health risks, such as the spread of communicable diseases, air and water pollution, soil contamination and food safety issues. Furthermore, the research explores various mitigating strategies, including community awareness programs, improved waste management systems, and the promotion of composting practices at the household and industrial levels. It was concluded that poor compost waste management in major Nigerian cities significantly endangers public health through pollution and disease transmission. These risks are heightened by weak infrastructure and low public awareness. The research recommended that government agencies such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) and state environmental protection bodies must be empowered to monitor and regulate waste treatment and disposal practices.

KEYWORDS: Compost Waste, Public Health, Healthy Society, Urbanization, Mitigation Strategies, Healthy Society and Nigeria

-NTRODUCTION

The rapid pace of urbanization in Nigeria, particularly in its major cities such as Lagos, Abuja, Port Harcourt, and Kano, has significantly amplified the generation of municipal solid waste. Among these wastes, compostable organic materials which include food scraps, agricultural residues, yard trimmings, and other biodegradable substances constitute a substantial proportion. Despite their potential for resource recovery through composting, improper management of these organic wastes poses critical public health challenges. Decomposing compost waste, when left unmanaged or poorly treated, becomes a breeding ground for disease vectors such as flies, rodents, and mosquitoes, and contributes to water and air pollution through leachate runoff and the emission of harmful gases like methane and ammonia.

The environmental health implications of poorly managed compost waste include the spread of communicable diseases such as cholera, dysentery, and typhoid fever, which are

often prevalent in densely populated urban slums with inadequate sanitation infrastructure. Moreover, the odor nuisance and the psychological stress associated with living near unmanaged compost waste sites exacerbate the social burden on already vulnerable populations (Ogunjimi & Oyetola, 2020). These health risks are compounded by limited regulatory enforcement, public apathy, and infrastructural deficits in urban waste management systems across Nigeria.

Nevertheless, compost waste, when properly harnessed, can serve as a vital component in urban sustainability. Composting, as a waste-to-resource strategy, offers significant environmental and health benefits reducing landfill reliance, improving soil fertility, and decreasing greenhouse gas emissions. This duality underscores the need to evaluate both the detrimental and beneficial impacts of compost waste on public health in urban Nigeria. More importantly, it highlights the necessity of developing and implementing effective mitigation strategies such as public awareness campaigns, improved waste segregation, decentralization of composting facilities, and the integration of informal waste collectors into formal waste management frameworks (Ogunleye et al., 2023). This research, therefore, seeks to critically evaluate the impact of compost waste on public health in major Nigerian cities, with a view to identifying and recommending sustainable mitigating strategies that can foster a healthier society.

CONCEPT OF COMPOST OF WASTE

The concept of compost of waste refers to the natural and controlled biological process through which organic waste materials—such as food scraps, plant remains, and animal manure—are broken down by microorganisms, fungi, and other decomposers into a nutrient-rich, soil-like substance called compost. This process plays a critical role in sustainable waste management, as it not only reduces the volume of waste sent to landfills but also recycles essential nutrients back into the soil. Composting has been practiced for centuries and is increasingly recognized today as an essential component of circular economy systems aimed at achieving environmental sustainability (Haug, 2018).

Composting involves both aerobic decomposition, which requires oxygen, and in some cases anaerobic methods, which occur in the absence of oxygen. The most common method, aerobic composting, supports the growth of beneficial microorganisms that break down organic matter into simpler components. The process generates heat, which kills pathogens and weed seeds, ensuring that the resulting compost is safe and beneficial for agricultural or gardening use. The balance of carbon-rich (brown) and nitrogen-rich (green) materials, moisture, and regular aeration are critical factors that influence the speed and quality of the composting process (Bernal, Sánchez-Monedero, Paredes & Cegarra, 2018).

One of the most significant benefits of composting is its contribution to soil health. Compost improves soil structure, enhances its water-holding capacity, and supplies it with essential nutrients such as nitrogen, phosphorus, and potassium. This reduces the need for synthetic fertilizers, which are often harmful to the environment. Moreover, composting mitigates greenhouse gas emissions by diverting organic waste from landfills, where it would otherwise decompose anaerobically and produce methane—a potent greenhouse gas (Vaneeckhaute, Meers, Michels & Ghekiere, 2019).

There are various composting techniques depending on the scale and purpose, including backyard composting, vermicomposting using earthworms, and industrial composting

which utilizes advanced technologies for faster decomposition. Each method requires a specific balance of inputs and environmental conditions. For instance, vermicomposting is effective for household waste and produces a high-quality compost called vermicast, while large-scale operations often use windrow or in-vessel systems for municipal and agricultural waste (Gea, Barrena, Artola & Sánchez, 2018).

CONCEPT OF PUBLIC HEALTH

The concept of public health revolves around the organized efforts of society to prevent disease, promote health, and prolong life among the population as a whole. Unlike clinical medicine, which focuses on diagnosing and treating illnesses in individuals, public health aims at protecting and improving the health of entire communities or populations. It encompasses a wide range of activities, including disease surveillance, sanitation, vaccination, health education, and policy-making. The primary goal is to create conditions in which people can be healthy, through prevention rather than cure (Winslow, 1920; Schneider & Everts, 2020).

Public health operates on several levels—local, national, and global—and includes a variety of sectors such as healthcare, education, housing, and environmental services. One of the core functions of public health is epidemiology, which involves the study of disease patterns, causes, and effects in populations. Public health professionals use epidemiological data to detect outbreaks, understand risk factors, and guide public policies. For example, during the COVID-19 pandemic, public health strategies such as contact tracing, social distancing, and mass vaccination were implemented to reduce transmission and safeguard public well-being (Heymann, 2021).

Another key aspect of public health is health promotion and disease prevention. This involves encouraging healthy lifestyles, preventing risky behaviors, and implementing screening programs for early disease detection. Education on hygiene, nutrition, exercise, sexual health, and substance abuse are all part of health promotion initiatives. These efforts are often directed at reducing the burden of non-communicable diseases like heart disease, diabetes, and cancer, which are now leading causes of death globally (World Health Organization, 2021).

Environmental health, a branch of public health, focuses on the external factors that affect human health, such as air and water quality, waste disposal, and exposure to hazardous chemicals. Public health authorities regulate pollutants and enforce safety standards to prevent environmental illnesses and ensure communities live in clean and safe surroundings. In recent decades, concerns over climate change, industrial pollution, and urbanization have emphasized the importance of integrating environmental considerations into public health planning (Frumkin, 2021).

CONCEPT OF HEALTHY SOCIETY

Healthy society extends beyond the absence of disease to encompass a state of complete physical, mental, and social well-being for all members of a community. It refers to a societal condition where individuals not only live longer live but also lead fulfilling and productive lives in an environment that supports their overall wellness. A healthy society ensures access to basic necessities like clean water, nutritious food, healthcare, education, shelter, and security. These foundational elements are essential for people to thrive and contribute meaningfully to the progress of their communities (World Health Organization, 1948; Marmot, 2020).

At the core of a healthy society is health equity, which means everyone has a fair and just opportunity to attain their highest level of health. This involves removing obstacles such as poverty, discrimination, and lack of access to good jobs, education, and healthcare. Inequities in these areas often lead to health disparities that disproportionately affect vulnerable populations. Building a healthy society requires intentional efforts to close these gaps through inclusive policies, targeted health programs, and community engagement (Braveman, Arkin, Orleans, Proctor, & Plough, 2018).

Social determinants of health play a critical role in shaping the well-being of a society. These determinants include factors such as education, income, employment, housing, neighborhood conditions, and social support networks. For example, individuals who have stable housing, quality education, and access to nutritious food are more likely to experience good health. Therefore, efforts to create a healthy society must go beyond the healthcare sector and involve multi-sectoral collaboration across government, civil society, and the private sector to improve the conditions in which people are born, grow, live, work, and age (Solar & Irwin, 2010).

Mental and emotional well-being is also a vital component of a healthy society. It involves promoting mental health, preventing mental illness, and ensuring access to mental health services. Societies that prioritize emotional wellness tend to have lower rates of substance abuse, violence, and suicide, and they foster environments where individuals feel valued and connected. Community cohesion, cultural inclusion, and social justice are important pillars that contribute to collective mental well-being (Patel, Saxena, Lund, Thornicroft, Baingana, Bolton & Unützer, 2018).

Environmental sustainability is another crucial element. A society cannot be truly healthy if its environment is polluted, degraded, or unsafe. Clean air, safe drinking water, green spaces, and a stable climate are essential for human health and the sustainability of future generations. Addressing issues such as climate change, waste management, and environmental justice ensures that all people—regardless of socioeconomic status—can live in a healthy ecosystem. Public policies that enforce environmental protections are vital to achieving and maintaining a healthy society (Watts et al., 2018).

IMPACT OF COMPOST WASTE ON PUBLIC HEALTH

Compost waste, primarily composed of biodegradable organic matter such as food scraps, leaves, agricultural residues, and other natural materials, holds great potential for environmental sustainability when properly managed. However, when mishandled particularly in rapidly urbanizing regions like major Nigerian cities compost waste can become a significant public health hazard. The impact of compost waste on public health is multifaceted, involving direct and indirect exposure pathways that can lead to disease transmission, environmental pollution, and compromised quality of life.

Spread of Communicable Diseases: one of the most immediate health risks associated with improperly managed compost waste is the proliferation of disease vectors. Decomposing organic waste attracts flies, mosquitoes, rats, and cockroaches, all of which are known carriers of infectious diseases such as cholera, typhoid fever, malaria, dysentery, and Lassa fever.

Air and Water Pollution: the anaerobic decomposition of compost waste releases harmful gases such as methane (CH_4), hydrogen sulfide (H_2S), and ammonia (NH_3), which contribute

to air pollution and can cause respiratory problems, headaches, nausea, and eye irritation among nearby residents. Methane is also a potent greenhouse gas that worsens climate change. Furthermore, runoff from compost piles can carry pathogens and nutrients into nearby water sources, contaminating drinking water and facilitating the spread of waterborne diseases (Adefemi, 2022).

Soil Contamination and Food Safety Issues: if compost waste is not adequately processed before being used in agriculture, it can introduce harmful pathogens and heavy metals into the soil. Crops grown in such contaminated soil may absorb these toxins, leading to long-term health problems in consumers, including gastrointestinal infections, heavy metal poisoning, and chronic diseases.

Psychological and Social Impacts: living in close proximity to decomposing compost waste piles has been linked to mental stress, stigma, and reduced quality of life. Offensive odors, persistent insects, and the visible presence of decaying waste can cause anxiety, sleep disturbances, and a sense of environmental neglect. These factors can diminish community morale and lead to social tension, especially in high-density urban areas where space is limited and residents feel powerless to influence local waste management decisions (Abdulfatai, 2021).

Occupational Hazards for Waste Workers: individuals involved in the informal handling and processing of compost waste often without protective gear or adequate training are at high risk of exposure to pathogens, toxic substances, and physical injuries. These include waste pickers, compost facility workers, and street sweepers, many of whom operate in hazardous conditions with limited health support. They may suffer from skin infections, respiratory illnesses, and musculoskeletal injuries due to prolonged exposure and manual labor (Ogunleye et al., 2023).

MITIGATING STRATEGIES AGAINST THE IMPACT S OF COMPOST WASTE ON PUBLIC HEALTH

Strengthening Waste Management Regulations and Enforcement: government agencies must enforce existing environmental and waste management laws while updating them to reflect current realities. For example, the National Environmental (Sanitation and Wastes Control) Regulations should be revised to include specific provisions for compost waste, with clear penalties for non-compliance. Regulatory enforcement ensures that composting practices are standardized; waste is properly sorted at source, and health risks from unregulated compost piles areminimized.

Decentralized and Community-Based Composting Systems: establishing small-scale composting facilities within communities, markets, and institutions helps reduce transportation needs and encourages local participation. These systems should use aerobic composting methods to prevent the release of harmful gases and pathogens. This promotes hygienic compost production, reduces vector breeding sites, and encourages community responsibility for sanitation (Oyediran, 2019).

Public Education and Awareness Campaigns: large-scale awareness programs using radio, schools, religious centers, and social media should be deployed to educate citizens on the importance of compost waste segregation, risks of poor handling, and benefits of safe composting. Informed citizens are more likely to adopt safe disposal practices, sort waste at the source, and avoid dumping organic waste in open areas. This leads to a cleaner environment and lower disease incidence.

Integration of Informal Waste Workers: informal waste pickers and compost handlers should be formally registered, trained, and supported with personal protective equipment (PPE), gloves, and hygienic composting kits. This professionalization not only improves safety but also enhances waste sorting efficiency, reduces occupational hazards, and creates green jobs.

Promotion of Waste Segregation at Source: mandate segregation of biodegradable (compostable) and non-biodegradable waste in households, markets, and public institutions through the use of color-coded bins and civic education. Segregation reduces contamination of organic waste, improves the quality of compost, minimizes leachate production, and simplifies waste processing.

Investment in Sanitary Composting Infrastructure: municipal governments should invest in mechanized and sanitary composting facilities equipped with temperature control, leachate drainage, and pathogen-neutralization systems. Public-Private Partnerships (PPPs) can help fund and operate these systems. This significantly reduces the release of pathogens and offensive gases, protects nearby residents, and produces higher-quality compost for agricultural use.

Health Surveillance and Disease Monitoring: integrate compost waste-related health surveillance into municipal health systems to track outbreaks of waste-related diseases such as cholera and Lassa fever. This data should guide policy decisions and rapid response measures. Early detection and response to public health threats reduce disease burden and allow for evidence-based interventions (Ogunjimi & Oyetola 2020).

Incentives for Safe Composting Practices: provide tax reliefs, subsidies, or recognition to communities and businesses that follow safe composting protocols. Microloans and grants can also be issued to youth-led compost startups. Financial incentives boost participation in composting, encourage innovation, and shift public perception from waste as a nuisance to a valuable resource.

CONCLUSION

The study concludes that poor compost waste management in major Nigerian cities significantly endangers public health through pollution and disease transmission. These risks are heightened by weak infrastructure and low public awareness. However, adopting effective mitigation strategies such as community-based composting, improved sanitation policies, and public education can greatly reduce these impacts. A shift toward sustainable practices will enhance both environmental and health outcomes. Ultimately, proactive and inclusive waste management is essential for building a healthy urban society.

RECOMMENDATIONS

1. Government agencies such as the National Environmental Standards and Regulations Enforcement Agency (NESREA) and state environmental protection bodies must be empowered to monitor and regulate waste treatment and disposal practices.
2. Local governments should invest in small-scale composting hubs and provide training and starter kits for residents and cooperatives. Decentralized composting managed at community, market, or institu*tional levels can reduce transportation burdens, limit environmental contamination, and promote localized organic waste recycling.

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