



Assessing the Impact of Sachet Water Disposal Practices on Urban Environmental Health in Southern Nigeria

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Abstract: *This research investigated the impact of sachet water disposal practices on the environmental health of urban Nigeria. The study used both practice and scientific data collection to gather survey, water, and disease check information. The data was analyzed using SPSS. The results showed that 85% of waste in sachet water was unsanitarily disposed of, with 40% dumped on the streets and 25% dumped in drainage systems. The pollution of water bodies in urban areas was alarming, with plastic levels ranging from 10 mg to 150 mg per liter. High waste areas also showed increased incidence rates of waterborne diseases, such as typhoid (15%), cholera (12%), dysentery (8%), and hepatitis A (5%). The population's knowledge of proper disposal methods was generally low, with 25% fully aware, 20% knowing the right method but not using it, 30% having minimal understanding, and 25% having no knowledge at all. The study found that improper disposal rates had decreased from 70% in 2020 to a projected 50% in 2024. However, further improvement is needed in waste management infrastructure, laws and penalties, public awareness, and encouraging responsible and sustainable waste disposal practices.*

Keywords: *Environmental Pollution, Sachet Water Wastes, Waterborne Diseases, Water Quality.*

1. INTRODUCTION

Consumption of sachet water in urban areas across the country has significantly increased urbanization and population, leading to significant environmental responsibilities, including the disposal of sachet water waste. Nowadays, sachet water is a product packaged in a small polyethylene bag that is considered a primary and very accessible source of drinking water for millions of people in Nigeria because of its price. However, the proliferation of sachet water has resulted in a substantial environmental problem: the dispersion of these plastic sachets, as described by Dumbili & Henderson (2020), Ajala et al. (2020), and Jerumeh et al. (2020).



Thus, the research aims to analyze the impact of sachet water disposal on urban environmental health in Nigeria, a topic that is pertinent in several ways, as we will elaborate below.

Plastic sachet water waste, particularly in urban settings, presents a significant challenge due to its haphazard disposal on streets, drainage systems, rivers, and other easily accessible locations, thereby exacerbating the environmental situation (Stanley et al., 2020; Henderson and Dumbili, 2021).

Furthermore, plastic waste stream pollution of various water channels may also cause the spread of water-borne diseases like cholera, typhoid, dysentery, and more (Adjei et al., 2021; Kusa & Joshua, 2022; Yuksel et al., 2021). These ailments particularly affect poor populations where access to health and relevant commodities like water is scarce. Though this research focuses on the linkage between sachet water waste and public health, the results obtained will be useful in informing policies and practices that aim at reducing instances of poor hygiene in the community. It therefore warrants the investigation of sachet water disposal practices with a view to influencing policy decisions and improving the effective governance of the sub-sector.

Existing and current waste management policies in Nigeria are ineffective, insufficiently strengthened, and unrestrained by the law, leading to a higher rate of non-adherence and environmental damage. This study provides data on the consequences of sachet water waste, enabling the development of adequate policies and regulations. Policies such as enhanced police enforcement of waste disposal laws and legislation, providing for incentives for recycling and rehabilitation, and public campaigns aimed at creating awareness about waste disposal among the population would go a long way in enhancing proper waste management. The government's support is critical for providing and maintaining environmental and health compliance, as well as helping cities grow more efficiently.

2. RELATED WORKS

Studies on the effect of sachet water disposal on the environment and health within cities have steadily attracted research interest in the recent past, particularly in developing nations where most people rely on sachet water. Researchers have focused on various forms of pollution, especially those stemming from single-use plastics like sachet water packaging. Issac and Kandasubramanian (2021) pointed out that plastics litter the entire planet, particularly water bodies, polluting the seas and waterways and harming marine and wildlife. They underscored the importance of better waste management for minimizing such effects on the environment. With regard to the situation in Nigeria, Ifeanyichukwu et al. (2021) discussed the problems of solid waste management in the context of concentration in urban areas and pointed out that plastic waste, particularly materials used for sachet water packaging, is widespread. The analysis indicated that limited infrastructure, unsatisfactory waste collection practices, and a low level of public awareness about environmental issues led to the improper disposal of plastic waste. As a result, this study emphasizes the need to consider field disposal practices and their impacts. It is a well-known fact that plastics and other waste have adverse effects on health. Zolotova et al. (2022) further elucidated their study on the potential risks that microplastics in water pose to human health, particularly through water consumption. According to their study, there are likely health risks associated with microplastic intake;



gastrointestinal issues are among the possible dangers. Okpara et al. (2021) also investigated the correlation between environmental imprints and health in specific communities in Nigeria, primarily impacted by waste dumpsites. In these places, they found high cases of respiratory and digestive illnesses commonly referred to as waterborne diseases, warning that improper disposal of plastics could lead to such ailments. This underscores the need to focus specific public health campaigns on areas where the most common disposal of sachet water occurs.

2.1 Gaps in the Literature

Despite extensive research on plastic pollution, there are gaps in the literature regarding sachet water waste in Nigeria. Many studies focus on general plastic waste without addressing the unique challenges posed by sachet water packaging. In urban Nigerian contexts, there is a lack of research on the health impacts of sachet water waste. To effectively manage waste, we need localized research that takes into account the diverse cultural and economic landscapes of Nigerian cities.

2.2 Objectives of the Study: The study

- i. Investigated the common disposal methods of sachet water packaging.
- ii. Assessed the level of public awareness regarding proper disposal practices.
- iii. Examined the environmental effects of incorrect sachet water disposal, including the impact on soil, waterways, and urban landscapes is significant.
- iv. Assessed the contribution of sachet water waste to urban pollution and flooding.
- v. Analyzed the likely effects of environmental pollution caused by improper disposal of the sachet water packaging.
- vi. Assessed the current policies and regulations that govern waste management processes and practices for sachet water disposal.

3. MATERIAL AND METHODS

This study employed an integrated approach to investigate the impact of sachet water disposal practices on Nigeria's urban environment. This strategy entailed using questionnaires, observation, and tests in addition to the survey method to gain a comprehensive understanding of the problem.

3.1 Study Area: We conducted the study in fifteen urban centers selected from Edo and Delta States within Nigeria, encompassing large city areas and growing towns. These include areas with a wide range of infrastructure, disposal practices, and subsequent environmental health implications.

3.2 Data Collection: We administered personal questionnaires to participants to identify their knowledge of disposal methods, awareness level, and waterborne diseases.

We distributed the survey to households, businesses, and waste management personnel in the study areas. Interviews with key stakeholders provided qualitative insights into disposal practices and policy effectiveness. We collected water samples from various urban water bodies to measure pollution levels. We used laboratory techniques like microplastic analysis to analyze the concentration of plastic particles in the samples.



3.3 Data Collection: We obtained the incidence rates of waterborne diseases from local health departments and hospitals. We correlated this data with environmental sampling locations to identify potential hotspots for health issues related to sachet water waste.

3.4 Data Analysis

1. **Quantitative Analysis:** We used statistical software to analyze survey data, calculating the percentage of each disposal method (Table 1) and the level of public awareness (Table 4). We analyzed health data to determine the incidence rates of specific waterborne diseases in areas with high levels of sachet water waste (Table 2). We reported pollution levels in water bodies as concentrations of plastic particles (Table 3).
2. **Trend Analysis:** We evaluated the effectiveness of waste management policies over a five-year period by analyzing changes in the rates of improper and proper disposal methods (Table 5). The trend analysis involved comparing annual data to determine the percentage reduction in improper disposal practices.
3. **Qualitative Analysis:** We transcribed and coded interviews and open-ended survey responses to identify common themes and insights regarding public attitudes, challenges, and suggestions for improving sachet water disposal practices.

4. RESULTS AND DISCUSSION

The results of the study are presented in Tables 1-5.

Table 1: Disposal Methods of Sachet Water Waste

Disposal Method	Percentage (%)
Improper disposal (streets)	40%
Improper disposal (drainage)	25%
Open dumping	20%
Proper disposal (recycling)	10%
Proper disposal (landfill)	5%

Table 1 gives a systematic categorization of all the approaches to discharging sachet water waste in the urban Nigeria. It indicates that 40% of sachet water sachets are dumped on streets and other facilities adding to littering and creating health and environmental problems. This waste is one that clogs the drainage systems with even more potentiality to worsen the flooding situation while at the same time providing breeding places for disease-carrying insects. Out of sachet water reuse, a quarter is found to drain into the drainage system, posing a threat to sanitation in urban water systems resulting in water stagnation, rise in waterborne diseases, and localized flooding.

Open dumping is widely practiced and responsible for disposing of 20% of sachet water waste, especially within residential neighborhoods, thus directly threatening the health of the inhabitants. It can facilitate environmentally hazardous wastes to seep into the soil and water table, thereby polluting the water available for human consumption and irrigation. This practice indicates that most of the urban facilities do not have any means of disposing their wastes through proper channels and shows how important it is to come up with proper means of handling wastes.

On the positive side, 10% of the sachet water waste collected is recycled, thus showing that



there is some level of awareness of the procedure as well as the structural framework of recycling. At the same time, there remains considerable potential for enhancing and disseminating awareness of recycling efforts. Finally, only 5% of sachet water waste is disposed of in landfills, which indicates a low level of access or utilization of formal landfill sites for sachet water waste.

This, therefore, means that 85 percent of sachet water Nationwide are found abandoned and pollute the environment while only 15 percent are recycled or taken to landfill sites.

Table 2: Incidence of Waterborne Diseases in High Waste Areas

Disease	Incidence Rate (%)
Cholera	12%
Typhoid	15%
Dysentery	8%
Hepatitis A	5%
Total	40%

Table 2 shows that urban areas have high incidence rates of waterborne diseases due to poor waste disposal and water pollution. Plastic-contaminated water causes typhoid fever, which has the highest rate at 15%, indicating a close relationship between poor waste disposal and water pollution. Cholera, contracted through drinking water containing *Vibrio cholerae*, has a higher rate at 12% due to poor disposal in streets and drainpipes. Dysentery, an inflammatory intestine disease, has an 8% incidence rate as the population grows in regions with increased water pollution. Hepatitis A, an infectious liver disease, has a 5% incidence rate. These diseases have a total incidence rate of 40%, a chronic public health cost attributed to inadequate waste disposal and hygiene. Overcoming the waste problem from sachet water can significantly reduce these diseases and improve the social and health conditions of citizens in Nigerian urban areas.

Table 3: Pollution Levels in Urban Water Bodies

	Plastic Particle Concentration (mg/L)
River Ethiope	150 mg/L
Oboshi River	100 mg/L
Ikpoba River	130 mg/L
Agbor Moat	110 mg/L
Orogodo River	120 mg/L

The level of plastics found in water sources in selected urban areas in Nigeria is presented in Table 3 to both highlight the level of plastic pollution and the impact of such actions on the environment due to negligence in the disposal of waste. At 150 ml, River Ethiope has the highest pounds of plastic particles per liter, an aspect we shall attribute to raw sewage discharge and the effect of runoff water from urban centers. To this end, the floating sachet wastes in the River Ethiope indicate that plastic packaging is one of the biggest polluters of water, endangering the lives of aquatic organisms and other inhabitants of the water ecosystem. In terms of the environmental impact, the concentration of plastics in the Oboshi River is 100



mg/L, a level of concern as it disrupts the functioning of ecosystems and the quality of the water. The concentrations are 130 mg/L for the Ikpoba River and 110 mg/L for Agbor Moat, suggesting that both water sources suffer from plastic waste throwing, which tends to accumulate on the banks of river systems and other water channels, thereby affecting natural ecological systems. The Orogodo River exhibited a concentration of 120 mg/L, placing it in the same category as other water bodies, highlighting the necessity for the development of sustainable methods for managing water resources. Reducing plastic pollution entails appropriate waste management, proper legislation to regulate environmental pollution, and increasing people's awareness and inclusion about water body protection.

Table 4: Public Awareness of Sachet Water Disposal Practices

Awareness Level	Percentage (%)
Fully aware and practice proper disposal	25%
Aware but do not practice	20%
Somewhat aware	30%
Not aware	25%

Table 4 shows that 25% of respondents in Nigeria are aware of proper waste disposal methods, but 20% do not consistently apply these practices, indicating a knowledge-action gap. Mitigating this gap through education and awareness could enhance sustainable waste management behaviors. 30% are somewhat aware, but may not fully understand the environmental or health impacts of improper disposal. Increasing awareness and providing clear information on the consequences of improper disposal could motivate individuals to adopt more responsible behaviors. One-quarter of respondent's still lack knowledge about proper sachet water treatment, indicating that society lacks adequate information. Specific advocacy and sensitization efforts, such as direct educational initiatives, could help influence change in behavior and positively impact waste management. Strengthening public vigilance and sensibilization is crucial for supporting appropriate sachet water disposal in Nigeria.

Table 5: Effectiveness of Waste Management Policies (5-year Period)

Year	Improper Disposal (%)	Proper Disposal (%)	Reduction in Improper Disposal (%)
2020	70%	30%	-
2021	65%	35%	7.1%
2022	60%	40%	14.3%
2023	55%	45%	21.4%
2024	50%	50%	28.6%

Table 5 illustrates the effectiveness, inefficiency, and evaluation of waste management policies in Nigeria over a five-year period, specifically focusing on the improper and proper disposal of sachet water waste. Out of the total sachet water waste in 2020, 70% did not go through the proper channels of disposal, while 30% underwent the proper means of disposal. In 2021, improper disposal will reduce to 65%, while proper disposal will reduce to 35%. This represents 7.1%. These relatively low initial rates indicate that waste management policies and



measures implemented during this period started increasing, possibly due to enhanced awareness, improved waste management facilities, or tough compliance measures on waste disposal.

In 2022, the percentage of improper disposals was 60%, while the percentage of proper disposals was 40%, indicating a slight improvement of 14.3%. This is a 3% decrease compared to the results of the previous year, which was 2020. This upsurge implies that the power of public policies is increasing, and this could be due to building public awareness and steady progress in upgrading infrastructure. In 2023, improper disposal accounted for 55% of sachet water waste products, whereas proper disposal accounted for 45%, resulting in a 21.4% reduction in improper disposal. In 2024, the percentage of improper disposal dropped to 50%, while 50% of waste underwent proper disposal, resulting in a 28.6% decrease in improper disposal during the five-year period. This progress highlights the importance of continued investment in waste management infrastructure, public education, and policy enforcement to sustain and further enhance proper waste disposal practices in Nigeria's urban areas.

Discussion

The findings presented in this study give a complete perspective on the disposal of sachet water in relation to urban environmental health in southern Nigeria. The study reveals important information regarding the observance of ill-advised ways of waste disposal, the link between waste management and population health, and the efficiency of contemporary waste management legislation. Such findings can be useful when considering the goals specified in the study as its aims.

Firstly, the assessment of sachet water consumption and disposal, along with their associated effects, reveals a significant tendency towards improper disposal methods. Table 1's analysis reveals that streets disposed of a significant proportion of sachet water at 40%, drainages at 25%, and open dumps at 20%. This elucidates the high frequency of incorrect disposal and underscores the importance of effective waste management and raising public awareness about appropriate disposal techniques. The data clearly demonstrates that infrastructure and public conduct towards garbage are inadequate, highlighting a significant issue that demands attention. Manjaya et al. (2019) also reported that 75% of source water complied with WHO guidelines, but only 38% of packaged water met the WHO standards, calling for hygiene education of vendors to prevent further contamination and recontamination in Malawi.

As a result, the consequences of disposing of sachet water are quite serious for the environment. Table 3 reveals that out of all these water bodies in an urban setting in southern Nigeria, both the River Ethiope and the Ikpoba River had high plastic pollution, with the River Ethiope having 150 mg/L. The relatively high levels of plastic pollution suggest that the ecosystem is highly contaminated and may be the result of poor waste management. Plastics floating in water are normally disruptive to ecosystems, dangerous to animals, and render water undrinkable. Such environmental impacts reaffirm the need and importance of proper waste management facilities, as well as increased measures to curb the use of plastics, which consequently contribute to pollution of aqueous bodies in urban areas.

The community's health hazards closely correlate with the consequences of sachet water waste disposal. As presented in Table 2, there is a unanimous consensus that a high level of sewage pollution is associated with an increased level of waterborne diseases. Another important



disease is typhoid fever. Cholera, dysentery, and hepatitis A have incidence rates of 15%, 12%, 8%, and 5%, respectively. Pollution from improper waste disposal in the environment directly causes these diseases. The accumulation of plastic waste in consolidation bases in the drainage system and open dumps creates a conducive environment for bacterial and pathogenic growth, as well as the sustenance of such illnesses. Dumbili and Henderson (2020) alluded to the fact that the incorrect disposal of sachet water waste in Nigeria has potentially negative impacts on the ecological zone and human health.

The study found that the public's understanding and compliance with sachet water disposal practices, as outlined in Table 4, were lacking. Regarding actual knowledge and practice of proper disposal, only 25% of respondents were fully knowledgeable and complied with proper disposal, 30% were somewhat knowledgeable, and 25% had no knowledge at all. Muhammad et al. (2019) further affirmed this by stating that the majority of the public lacks comprehensible knowledge on the benefits, detrimental impacts, and health consequences arising from rampant or improper disposal of polyethylene bags. These findings of a lack of awareness and the lapse between knowledge and practice among the population demonstrate the dire need to engage the public in detailed campaigns and education. We should direct such campaigns to enhance adequate understanding of the consequences of improper waste disposal on the environment and human health, with an enhanced focus on sustainable waste management.

An assessment of the outcomes of waste management policies over a period of five years, presented in Table 5, reveals the general trend towards improving improper disposal rates. According to the given statistics, from 2020 to 2024, the increase was 28 percent. This indicates a 6% reduction in improper disposal practices and an improvement from 30 to 50 percent in proper disposal practices. This improvement implies that the policies and measures targeted at improving waste management, such as awareness creation, infrastructure development, and obedience to the law, are starting to bear fruit. However, the statistics also show that improper disposal of over fifty percent of sachet water sachets indicates a significant need for further action.

5. CONCLUSION

Having examined sachet water disposal practices in Nigeria, the research has established its extended influence on the urban health environment. Littering and dumping the left-over portions of sachet water, such as in streets, drainage systems, or open dumpyards, results in high cases of plastic pollution and waterborne diseases. There is an immediate health cost that urban dwellers pay, primarily due to sachet water waste: there is a high likelihood of contracting ailments such as typhoid, cholera, dysentery, and hepatitis A. Urban areas further compound these risks, as increased plastic pollution harms aquatic life and contaminates water sources. The study revealed that there is low knowledge and understanding by the public of the proper method of disposing of sachet water, thus implying that a large percentage of the public either lacks proper knowledge or does not apply the correct method of disposing of sachet water. Therefore, while attitudes towards waste management policies have improved over the last five years, further effort, commitment, and flexibility are required to consolidate and advance these gains.



Recommendations

This paper concludes that sachet water disposal in urban Nigeria requires a multi-sectorial solution that entails sustainable waste management investment, enforcement of policy, guidelines, and laws, awareness creation, and the provision of sustainable water packages. Other measures include using firm disciplinary measures for wrong disposal, setting standard rules and standards, and championing recycling culture. Improper waste disposal also has health effects, and improvements in community participation, sanitary facilities, and the availability of clean water all contribute to reducing the negative effects. It is important to note that the process of improvement is iterative and requires cooperation between governmental and non-governmental bodies, as well as private companies.

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