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ENVIRONMENTAL PROBLEMS OF PLASTIC WASTE AND ITS HEALTH IMPLICATIONS AMONG RESIDENTS OF RURAL COMMUNITIES IN LAGOS STATE, NIGERIA

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Abstract

This study examined the predisposing factors to improper plastic waste disposal and health outcome among residents of rural communities in Ikorodu Local Government Area of Lagos State. Three research hypotheses were postulated and the population of the study was all residents of rural communities in Ikorodu Local Government Area of Lagos State. The sample for this study was 150 residents selected from rural communities in Ikorodu Local Government Area of Lagos State. The purposive sampling technique was used to select one hundred fifty respondents. Data was collected with the use of self-developed questionnaire titled "Plastic Waste Disposal and Health Questionnaire (PWDHQ)". The questionnaire was a close ended type designed in line with the Modified Likert 4-point Scale of Strongly Agree, (SA), Agree-(A), Disagree-(D) and Strongly Disagree, (SD). To test the validity of the instrument, a copy of the questionnaire was given to two experts in the Department of Human Kinetics, Sports and Health Education for critical review, errors were corrected, and it was validated. The reliability of the instrument was conducted using the test-retest method. A total of 10 residents from rural community from Epe Area of Lagos State who were not part of the population n were selected for reliability test. The instruments collected were subjected to Pearson Product Moment Correlation Coefficient [PPMCC] which yielded coefficient 0.86 after calculation which indicates that the questionnaire was reliable. Data collected was analyzed using the descriptive statistics of frequency counts and percentage for demographic data while the inferential statistics of Chi-Square (X^2) was used to test all stated hypotheses at 0.05 alpha level. Findings from the study revealed

that land degradation, contamination of ground water was as a result of improper plastic waste disposal and plastic waste pollution has effect on aquatic life in rural communities in Ikorodu local Government Area of Lagos State. It was concluded that Plastic waste pollution can damage the soil fertility and affect crops production and the study recommend that Ikorodu local Government Area should provide plastic waste bins to all the rural communities so that residents can dump their waste for proper disposal, organize awareness programme for residents in rural areas on how to dispose plastic waste properly, collaborate with the state Ministry of Environment on how to clean up the plastic waste in the communities while residents should be encourage to dispose their plastic waste properly to avert the health consequences of plastic waste pollution

Keywords: *Predisposing Factors, Health Outcome, Access, Awareness, Population, Land Degradation, Contamination, Aquatic Life,*

Introduction

The discovery of plastics as useful materials for human existence, provide comfort and ease has now turned into a menace in the society and a pain in the neck as plastics have also become co-habitat of the human ecosystem. Plastics were made by men, but plastics now live way longer than the men who gave them the privilege of existence. Plastic is a synthetic, organic polymer made from petroleum with properties ideally suited for a wide variety of applications including: packaging, building and construction, household and sports, health and medical equipment, vehicles, electronics, and agriculture (Gaur, et al, 2024). Plastics have emerged as a pivotal component across diverse sectors such as packaging, construction, industry, transportation, and agriculture, significantly contributing to the advancement of modern society (Vlasopoulos et al., 2023). The unique attributes of plastics, including durability, resistance, lightweight nature, cost-effectiveness, and transparency, have led to large growth in global plastic consumption since their market inception (Ali et al., 2023). Nonetheless, the prevailing linear approach to materials management, characterized by intensive resource utilization and substantial waste generation, coupled with plastics' long degradation periods, leads to considerable environmental degradation and increased risks to human health (Tiwari et al., 2023).

The worldwide plastic production is calculated to be 400.3 million tons in 2022. Plastic production is thus expected to increase exponentially hereafter (Rafey & Siddiqui, 2021). Over 300 million tons of plastic are produced every year, half of which is used to create single-use items such as shopping bags, cups and straws. When discarded improperly, plastic waste can harm the environment and biodiversity. At least 14 million tons of plastic end up in the ocean every year. Plastic debris is currently the most abundant type of litter in the ocean, making up 80% of all marine debris found from surface waters to deep-sea sediments (United Nations, 2022). Plastic is found on the shorelines of every continent, with more plastic waste found near popular tourist destinations and densely populated areas. The main sources of plastic debris found in the ocean are land-based, coming from urban and storm water runoff, sewer overflows, littering, inadequate waste disposal and management, industrial activities, tyre abrasion, construction and illegal dumping. Ocean-based plastic pollution originates primarily from the fishing industry, nautical activities and aquaculture (United Nations Environmental Programme, 2021).

The management of plastic pollution has become a major international environmental priority. This is due to the observed and estimated damage that plastics, in particular, can cause to the environment, aquatic wildlife and ecosystems (both freshwater and marine) (Marazzi et al., 2020; Beaumont et al., 2019; Borrelle et al., 2017). UNEP (2018), research indicates that the world collectively produces more than 400 million tons of plastic every year, of which 36 percent is SUP (single-use plastic) packaging. It is estimated that by 2030, approximately 344 Mt of polymers and plastic will be used in Africa if there are no policy changes to reverse this trend (UNEP, 2021: Babayemi et al., 2019). Overall, 46 per cent of plastic waste is landfilled, while 22 per cent is mismanaged and becomes litter. Unlike other materials, plastic does not biodegrade. It can take up to 1,000 years to break down, so when it is discarded, it builds up in the environment until it reaches a crisis point. This pollution chokes marine wildlife, damages soil and poisons groundwater, and can cause serious health

impacts. Plastic pollution also contributes to the climate crisis. The production of plastic is one of the most energy-intensive manufacturing processes in the world. The material is made from fossil fuels such as crude oil, which are transformed via heat and other additives into a polymer. In 2019, plastics generated 1.8 billion metric tonnes of greenhouse gas emissions – 3.4 per cent of the global total (United Nations, 2022).

By the year 2024, it was projected that the global production of plastic waste will reach approximately 399 million metric tons (OECD, 2022), with a significant fraction destined for landfills, unregulated dumping sites, open burning, or uncontrolled release into natural environments, including marine ecosystems (Kibria et al., 2023). Research conducted by Smith et al. (2023) indicated that approximately 40% of current plastic production needs to be more adequately managed, with a mere 9% subjected to recycling processes (Akan, et al., 2021). Should the existing production, consumption, and waste management paradigms persist, the plastic industry is poised to account for 20% of total global oil consumption by the year 2050, effectively extending the market life of fossil fuels even as combustion technology is gradually phased out (Ellen MacArthur Foundation et al., 2016). Plastic pollution has become one of the most pressing environmental issues, as the rapidly increasing production of disposable plastic products overwhelms the world's ability to deal with them. This pollution is most visible in developing Asian and African nations, where municipal waste collection systems are often inefficient or non-existent. However, even developed countries struggle to properly collect discarded plastics, especially those with low recycling value. The One Health approach, a quadripartite collaboration signed by the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE), the UN Environment Programme (UNEP), and the World Health Organisation (WHO) recommends addressing the full spectrum of good health control – from prevention to detection, preparedness, response, and management – and contributing to global health security (WHO, 2024).

The resolution specifically targeted curtailing plastic pollution across marine and terrestrial environments (UNEP, 2022). This development produced a pathway for a global treaty framework that addresses plastics' life cycle from production to disposal, including material substitution and plastic waste prevention and mitigation through end-of-life management services. This resonates with the Sustainable Development Goals (SDGs) by promoting responsible resource utilization and waste minimization while advocating for circular economy practices such as recycling and reuse (Deeney et al., 2023; United Nations, 2015). Reflecting global concerns, the African continent is witnessing a rapid escalation in plastic consumption and waste generation, often outpacing the development of adequate management infrastructure (Praveena, 2024). In numerous African nations, approximately 80% of plastic waste is relegated to poorly managed landfills or dispersed across natural settings, exacerbating pollution in oceans, rivers, and terrestrial systems (Angnunavuri et al., 2023; Akan et al., 2021). Nigeria stands on the cusp of becoming a significant player in the global economy. However, it needs to help sustainably leverage its growth potential, notably in managing plastic waste. Nigeria alone represents 17% of Africa's total plastic consumption. Nigeria produced 513 kt of plastics in 2020 and was among the biggest African plastic producers. The country is a major plastic importer, contributing up to 5.85% of Africa's total imports, increasing from 1,498 kt to 1,962 kt between 2005 and 2020. The country generates an estimated 3,200 kt of solid waste per year, one of the highest amounts in Africa (Yalwaji et al., 2022).

The current mismanagement of plastic materials significantly endangers public health and the environment, as the country generates approximately 2.5 kt of plastic waste annually, mostly from packaging (Yerramsetti, 2024). Despite these staggering figures, only a minor fraction of this waste undergoes recycling or proper disposal (Heinrich Böll Foundation, 2019). Informal waste pickers remain at the core of the nation's plastic waste collection and recycling efforts, often operating under hazardous conditions in open dumpsites. These settings pose significant risks, including exposure to toxic emissions from plastic burning, leading to severe health implications. Studies highlight a prevalent lack of PPE and low awareness of health risks among these workers, exacerbating their exposure to respiratory and other severe health risks (Ogunkoya et al., 2022; Kehinde et al., 2020). Comparing with the adults, children appear to be most vulnerable to the harmful effects of pollutants exposure due to their stage of physical growth, immature immune system, and development of lung function with increased permeability of the respiratory epithelium (Ogunbamowo, et al., 2022). Challenges

within the African recycling sector, such as elevated operational costs and the absence of stable secondary markets for recycled materials locally, significantly hinder effective waste treatment and management strategies (Shomuyiwa et al., 2023). The plastic recycling industry in Africa is characterized by its volatility and fragmentation. Market participants often need help with an underdeveloped market for various grades of recycled plastic. This instability can hamper growth within the region. Due to the lack of end markets for recycled material, most recyclers are in Northern Africa (e.g., Marrocco and Egypt) and export their output to Europe, where demand for them is much higher than in local African markets (Holland, 2021). While recycling is promoted as a viable strategy to alleviate environmental and public health dilemmas, the comprehensive impacts of plastic waste management, particularly concerning human health, still need to be explored and better understood (Cook et al., 2023; Smith et al., 2023; Yerramsetti, et al., 2023).

Plastic is a highly useful material and its applications are expected to increase as more new products and plastics are developed to meet demands. The increased use and production of plastic in developing and merging countries is a particular concern, as the sophistication of their waste management infrastructure may not be developing at an appropriate rate to deal with their increasing levels of plastic waste. Unfortunately, the properties of plastic that make it so valuable also make its disposal problematic, such as its durability, light weight and low cost. It has been observed that most rural communities in Lagos State are littered with different types of plastic waste. Many plastic wastes even covered the lagoon and sea surfaces in riverine communities making fishing difficult for fish farmers. Observations also show that the residents in these rural communities are not bothered or aware of the environmental problems of this waste plastic in their communities and its health implications. To educate these rural communities' residents, there is the need therefore to examine the environmental problems of plastic waste and its health implications on residents of rural communities in Lagos State.

Purpose of the Study

The purpose of this study is to examine the environmental problems of plastic waste and its health implications among residents of rural communities in Lagos State. Other objectives of the study are:

1. To find out land degradation as an environmental problem of plastic waste in rural communities in Lagos State
2. To examine contamination of ground water as an environmental problem of plastic waste in rural communities in Lagos State
3. To find out the effect of plastic waste on aquatic life in rural communities in Lagos State

Research Hypotheses

The following formulated hypotheses were formulated and tested for the study:

1. Land degradation will not significantly be an environmental problem of plastic waste in rural communities in Lagos State
2. Contamination of ground water will not significantly be an environmental problem of plastic waste in rural communities in Lagos State
3. Plastic waste will not have significant effect on aquatic life in rural communities in Lagos State

Methodology

The study adopted the descriptive survey research design and the population of this study consisted of all residents of rural communities in Ikorodu Local Government Area of Lagos State. The rural communities in Ikorodu are over one million people (Lagos State Ministry of Rural Development, 2020). The rural communities were coastal areas where plastic waste is more common. The sample for this study consisted of 150 respondents from rural communities in Ikorodu Local Government Area of Lagos State. The purposive sampling technique was used to select the respondents for the study. Those who volunteered and consented to participated in the study were selected. The sample was selected as follows: Ijede 30, Gberibge 30, Bayeku 30,

Igbogbo 30, Igbo-Olomu 30. Total of one hundred and fifty respondents were selected from the rural communities in Ikorodu Local Government Area. Data was collected with the use of self-developed “Plastic Waste Disposal and Health Questionnaire (PWDHQ). The questionnaire was divided into two sections. Section A focused on demographic data of respondents while section B was used to elicit information on the variables selected for the study. The questionnaire was a closed ended type designed in line with the modified Likert 4-point Scale of Strongly Agree, (SA), Agree-(A), Disagree-(D) and Strongly Disagree, (SD). The instrument was validated by two experts in the Department of Human Kinetics, Sports and Health Education for content and construct related validity. All suggestions and corrections made were effected. The test-retest reliability method was adopted. A total of 10 residents from rural community from Epe Local Government Area of Lagos State who were not part of the population were selected for reliability test. Data collected from the first week administration of the instrument was correlated with the second week questionnaires. A total of 150 copies of questionnaires were administered by the researcher with the help of two trained research assistant. The questionnaires were administered in four weeks by hands to all the respondents and retrieved to avoid loss. Data collected was analyzed using the statistical tools of frequency counts and percentage for demographic data of respondents, while the inferential statistics of Chi-Square (X^2) was used to test hypotheses at 0.05 alpha levels.

Results

Table 1: Distribution of respondents by Age, Gender, Marital Status, Occupation and Communities

Age range	Frequency	Percentage
16-20 years	26	17.3
21-25 years	43	28.7
26-30 years	57	38
31 years & above	24	16
Total	150	100

Gender	Frequency	Percentage
Female	72	48
Male	78	52
Total	150	100

Marital status	Frequency	Percentage
Single	63	42
Married	87	58
Total	150	100

Occupation	Frequency	Percentage
Farming	41	27.3
Fishing	33	22
Trading	34	22.7
Water Transportation	37	24.7
Others	5	3.3
Total	150	100

Communities	Frequency	Percentage
Ijede	30	20
Gberigbe	30	20
Bayeku	30	20
Igbogbo	30	20
Igbo- Olomu	30	100
Total	150	

Table 1: Shows that a total of 26(17.3%) respondents were between the ages of 16-20 years, 43(28.7%) respondents were between the ages of 21-25 years, 57(38%) respondents were between 26-30 years while a total of 24(16%) were 31 years and above. Secondly, table 1 also show that 72(48%) respondents were females, while a total of 78(52%) respondents were males. More also, table 1 still show that 63(42%) respondents were singles, while a total of 87(58%) respondents were married. Consecutively, table 1 show that 41(27.3%) respondents were farmers, 33(22%) respondents were fishermen/women, 34(22.7%) respondents were traders, 37(24.7%) respondents were water transporters and a total of 5(3.3%) respondents were other professionals. Finally, 30(20%) questionnaires were administered to each community.

Hypothesis 1: Land degradation will not significantly be the health outcome of improper plastic waste disposal among residents of rural communities in Ikorodu Local Government Area of Lagos State.

Table 2: Chi-square (X^2) results on land degradation as health outcome of improper plastic waste disposal.

N	[X^2] cal	[X^2] table value	Df	LS	Remarks
150	454.5	7.82	3	0.05	Sig

From the table 2, it could be observed that the calculated Chi-square $X^2(3) = 454.5$, and p is ≥ 0.05 . The null hypothesis which stated that land degradation will not significantly be the health outcome of improper plastic waste disposal among residents of rural communities Ikorodu Local Government Area of Lagos State is hereby rejected. This implies that land degradation was the health outcome of improper plastic waste disposal among residents of rural communities in Ikorodu Local Government Area of Lagos State.

Hypothesis 2: Contamination of ground water will not significantly be the health outcome of improper plastic waste disposal among residents of rural communities in Ikorodu Local Government Area of Lagos State.

Table 3: Chi-square (X^2) results on contamination of ground water as health outcome of improper plastic waste disposal

N	[X^2] cal	[X^2] table value	Df	LS	Remarks
150	382.5	7.82	3	0.05	Sig

From the table 3, it could be observed that the calculated Chi-square $X^2(3) = 382.5$, and p is ≥ 0.05 . The null hypothesis which stated that contamination of ground water will not significantly be the health outcome of improper plastic waste disposal among residents of rural communities in Ikorodu Local Government Area of Lagos State is hereby rejected, indicating that contamination of ground water was the health outcome of improper plastic waste disposal among residents of rural communities in Ikorodu Local Government Area of Lagos State.

Hypothesis 3: Plastic waste pollution will not have significant effect on aquatic life in rural communities in Ikorodu Local Government Area of Lagos State.

Table 4: Chi-square (X^2) results on plastic waste pollution of aquatic life in rural community

N	[X^2] cal	[X^2] table value	Df	LS	Remarks
150	229.5	7.82	3	0.05	Sig

From the table 4, it could be observed that the calculated Chi-square $X^2 (3) = 229.5$, and p is ≥ 0.05 . The null hypothesis which stated that Plastic waste pollution will not have significant effect on aquatic life in rural communities in Ikorodu Local Government Area of Lagos State is hereby rejected. This implies that plastic waste pollution had effect on aquatic life in rural communities in Ikorodu Local government area of Lagos state.

Discussion

Hypothesis one which stated that land degradation will not significantly be the health outcome of improper plastic waste disposal among residents of rural communities in Ikorodu Local Government Area of Lagos State was rejected $X^2 (3) = 454.5$, and p is ≥ 0.05 , indicating that land degradation was a health outcome of improper plastic waste disposal among residents of rural communities in Ikorodu Local Government Area of Lagos State. These implies poor knowledge of the residents about the damage cause by indiscriminate disposal of plastic waste. This finding agrees with Gaur, et al. (2024) study reported that the indiscriminate disposal of plastic bottles and sachet water bags has led to the accumulation of plastic waste in open spaces, drainage systems, and water bodies. Redko, et al, (2024), evaluated the environmental and health concerns associated with disposing of waste plastic in municipal waste landfills (MWL). The findings revealed that disposing of waste plastic using the MWL approach contributes to severe environmental pollution and risks to human health. Holland, (2021) study reported that outcome of indiscriminate disposal of solid wastes expose human to environmental degradation such as in flooding, drainage obstruction, widespread of infectious diseases, cholera, diarrhea, typhoid fever, waterway blockage which leads to infestation of flies, ticks and breeding of mosquitoes that cause malaria and other plagues. Ogunbamowo, et al., (2024), asserted that study of residents of rural communities in Lagos State found that air pollution causes early life exposure to childhood influenza.

Hypothesis two which stated that contamination of ground water will not significantly be the health outcome of improper plastic waste disposal among residents of rural communities in Ikorodu Local Government Area of Lagos State was rejected $X^2 (3) = 382.5$, and p is ≥ 0.05 . This implies that contamination of ground water was a health outcome of improper plastic waste disposal among residents of rural communities in Ikorodu Local Government Area of Lagos State. This finding is in line with Zhang, et al, (2020) asserts that human health is also at risk due to microplastic pollution. Microplastics enter the human body by consuming contaminated seafood, drinking water, and even inhaling airborne particles. Gaur, et al, (2024), study reported that the indiscriminate disposal of plastic bottles and sachet water bags has led to the accumulation of plastic waste in open spaces, drainage systems, and water bodies. Gaur, et al. (2024), study reported that the outcome of indiscriminate disposal of solid wastes expose human to environmental degradation such as in flooding, drainage obstruction, widespread of infectious diseases, cholera, diarrhea, typhoid fever, waterway blockage which leads to infestation of flies, ticks and breeding of mosquitoes that cause malaria and other plagues. Redko, et al., (2024), evaluated the environmental and health concerns associated with disposing of waste plastic in municipal waste landfills (MWL). The findings revealed that disposing of waste plastic using the MWL approach contributes to severe environmental pollution and risks to human health

Hypothesis three which stated that plastic waste pollution will not have significant effect on aquatic life in rural communities in Ikorodu Local Government Area of Lagos State was hereby rejected $X^2 (3) = 229.5$, and p is ≥ 0.05 , indicating that plastic waste pollution had effect on aquatic life in rural communities in Ikorodu Local

Government Area of Lagos State. Because the rural community in Ikorodu area are densely populated. This finding support Babaremu, et al, (2022), reported that toxic contaminants also accumulate on the surface of plastic as a result of prolonged exposure to seawater. When marine organisms ingest plastic debris, these contaminants enter their digestive systems, and over time accumulate in the food web. Zhang, et al, (2020), asserts that human health is also at risk due to microplastic pollution. Microplastics enter the human body by consuming contaminated seafood, drinking water, and even inhaling airborne particles. Redko, et al, (2024), evaluated the environmental and health concerns associated with disposing of waste plastic in municipal waste landfills (MWL). The findings revealed that disposing of waste plastic using the MWL approach contributes to severe environmental pollution and risks to human health. Gaur, et al, (2024), study reported that the indiscriminate disposal of plastic bottles and sachet water bags has led to the accumulation of plastic waste in open spaces, drainage systems, and water bodies.

Conclusion

Based on the findings of this study, It was concluded that:

1. Plastic waste pollution can damage the soil fertility and affect crops production
2. Plastic waste pollution can contaminate the well and drinking water
3. The water/sea might not be comfortable for animals living in inside when plastic waste is disposed in the water/sea.

Recommendations

Based on the conclusions from the study, it was recommended that:

1. Ikorodu Local Government Area should provide plastic waste bins to all the rural communities so that residents can dump their waste for proper disposal
2. Ikorodu Local Government Environmental section should organize awareness programme for residents in rural areas on how to dispose plastic waste properly
3. Ikorodu Local Government should collaborate with the state Ministry of Environment how to clean up the plastic waste in the communities
4. Residents should encourage to dispose their plastic waste properly to avert the health consequences of plastic waste pollution

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