

Evaluation of Environmental Pollution and Public Health Hazards Related to Menstrual Hygiene Waste Management Practices in Port Harcourt Metropolis

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<https://doi.org/10.56201/ijgem.vol.12.no8.2026.pg230.242>

Abstract

This research examines the issues of environmental contamination and health threats related to the management of menstrual hygiene waste in the Port Harcourt Metropolis. A mixed-methods strategy was employed, which included a cross-sectional analysis involving 372 women of childbearing age alongside laboratory evaluations of pollutants released from the incineration of popular menstrual pad brands. The data collected from surveys were processed using descriptive statistical methods and chi-square analyses, whereas laboratory evaluations utilized Gas Chromatography–Mass Spectrometry and Atomic Absorption Spectroscopy techniques to identify organic pollutants and heavy metals. Environmental and health risks were assessed further using models such as the Enrichment Factor, Contamination Factor, Potential Ecological Risk Index, and Hazard Quotient. The results indicated a wide variety in brand usage with no single brand being predominantly favored, while the primary disposal method reported was municipal waste collection at a rate of 53.2%. Nonetheless, dangerous disposal methods such as incineration (19.5%), open dumping (13.1%), and flushing (7.3%) were still commonly practiced. Despite 80.1% of participants recognizing environmental pollution, and 95.1% understanding the public health impacts, 80.5% noted a lack of sufficient disposal facilities, showcasing a notable disconnect between understanding and action. It was estimated that around 11.39 million menstrual pads are disposed of monthly and about 136.66 million yearly, indicating a significant environmental impact. Laboratory findings indicated that levels of phenol and polycyclic aromatic hydrocarbons surpassed the allowable limits across all analyzed brands, though heavy metals showed only slight exceedances, and BTEX compounds were within safe limits. Statistical evaluations revealed a notable correlation between environmental awareness and disposal methods ($\chi^2 = 22.88$, $p < 0.05$), yet awareness did not translate to secure practices. The research concludes that the handling of menstrual waste in Port Harcourt presents substantial environmental and health risks, largely due to insufficient infrastructure and social behaviors. It suggests enhancing waste management systems, advocating for biodegradable options, and implementing focused public health initiatives to close the gap between awareness and practice, thus mitigating pollution risks.

Keywords: Environmental, Pollution, Health, Hazards. Menstrual, Hygiene & Waste

Introduction

The management of menstrual hygiene has gained significant global focus as a vital aspect of public health, gender fairness, and ecological sustainability. Despite enhancements in the availability of menstrual products in various urban areas, the handling of menstrual hygiene waste—especially single-use sanitary pads—continues to be an escalating issue for both the environment and public health. In swiftly growing metropolitan areas like Port Harcourt, the extensive use of disposable menstrual items has led to a notable rise in solid waste production, much of which is poorly managed. The current research estimates that nearly 136.7 million menstrual pads are produced each year within the city, emphasizing the magnitude of the waste issue and the urgent need to address its environmental effects. The environmental challenges stem not only from the sheer quantity of waste created but also from the ways it is disposed of. Data collected in this study indicates that while 53.2% of participants depend on municipal waste collection, a significant number still engage in harmful disposal methods, including burning (19.5%), open dumping (13.1%), and flushing (7.3%). These actions lead to various types of environmental contamination, such as air pollution from open burning, clogging of sewage systems, and the release of microplastics into soils and waterways. Similar trends have been observed in other developing areas where insufficient waste management systems force women to resort to unsafe disposal methods (Das et al., 2015; Oche et al., 2018). These insights deepen fears that menstrual waste significantly contributes to urban environmental decline.

In addition to environmental pollution, improper disposal of menstrual waste can lead to serious public health hazards. The research reveals that 95.1% of participants view menstrual waste as a public health issue, with major concerns including sewage blockages (66.7%), diseases from contaminated water (48.7%), and respiratory illnesses linked to incineration (25.6%). These views correspond with earlier research that associates inadequate menstrual waste management with sanitation difficulties and heightened risks of environmental health threats (Phillips-Howard et al., 2016; Sommer et al., 2015). Despite the high awareness level—80.1% of participants recognized the impacts of environmental pollution—unsafe disposal methods endure. This indicates a significant disconnect between awareness and actual practices, a phenomenon frequently observed in menstrual hygiene studies, where simply having knowledge does not translate into changed behaviors without the support of proper infrastructure (Sommer et al., 2020). Efforts to tackle the challenges associated with menstrual waste have included the encouragement of biodegradable sanitary options, enhancements in waste segregation practices, and the implementation of small-scale incineration systems. In this survey, participants expressed a preference for sustainable alternatives, with 39.0% supporting the use of biodegradable pads, 36.6% endorsing incineration, and 22.0% favoring segregated waste collection systems. Additionally, almost half of the respondents (48.8%) advocated for community-operated incinerators. Although these initiatives show promise, their success is often limited due to poor execution, insufficient enforcement of policies, and a lack of public funding for waste management infrastructure, especially in lower-income and middle-income environments.

An analysis of the current body of research shows that investigations into menstrual hygiene predominantly concentrate on accessibility, patterns of usage, and socio-cultural factors, while the environmental and toxicological effects of disposing of menstrual waste have received relatively little focus. Research conducted by Oche et al. in 2018 and Sommer et al. in 2020 stressed the challenges linked to behavioral and infrastructural issues, whereas Das et al. in 2015 brought attention to disposal problems in settings with limited resources. Despite these studies, there exists

a considerable gap in research that incorporates behavioral information alongside assessments of environmental pollution and evaluations of public health risks, especially in Nigeria. This research aims to fill that gap by merging findings from surveys regarding disposal habits and knowledge with considerations of environmental risks, thus offering a more thorough analysis of menstrual waste management. The issue of menstrual hygiene waste in the Port Harcourt Metropolis is complex, characterized by significant waste production, inadequate disposal systems, ongoing unsafe practices, and potential environmental and health dangers. While awareness levels are quite elevated, structural challenges are still obstructing the establishment of safe and sustainable waste management practices. Consequently, this research intends to assess the environmental pollution and public health threats connected to menstrual hygiene waste management practices, aiming to guide policy development, enhance infrastructure, and encourage lasting behavioral change.

Methodology

This research utilized a mixed-methods approach integrating a questionnaire poll with experimental laboratory tests to evaluate the disposal of menstrual pad waste and its related environmental and public health hazards in Port Harcourt Metropolis, Nigeria. The survey aspect provided numerical data regarding menstrual pad usage, amounts produced, favored brands, disposal methods, and understanding of health and environmental risks, while the laboratory part measured pollutants emitted from the burning of specific menstrual pad brands.

Primary survey information was gathered from women of reproductive age living in Port Harcourt Metropolis by means of a structured questionnaire. The study region included Port Harcourt City along with Obio-Akpor Local Government Areas, with participants chosen through a multistage sampling process incorporating purposive, stratified, and random sampling methods. Three frequently used menstrual pad brands were intentionally chosen for laboratory testing based on their reported usage rates, accessibility, and presence in the market. A minimum sample size of 400 participants was calculated using Yamane's formula at a precision level of 5%. The questionnaire was administered using both in-person and digital methods, ensuring participation was voluntary and based on informed consent while maintaining confidentiality and anonymity. In the laboratory portion of the study, several units of the three selected menstrual pad brands underwent controlled incineration simulating typical burning practices. The ash produced was collected, blended to ensure uniformity, and stored in airtight containers that were free from contamination prior to analysis. Organic pollutants such as phenol, benzene, toluene, ethylbenzene, xylene (BTEX), and polycyclic aromatic hydrocarbons (PAHs) were identified using Gas Chromatography–Mass Spectrometry (GC–MS). Heavy metals like cadmium, lead, chromium, arsenic, and zinc were assessed via Atomic Absorption Spectroscopy (AAS) and/or Inductively Coupled Plasma Mass Spectrometry (ICP–MS). The leaching potential was evaluated utilizing the Toxicity Characteristic Leaching Procedure (TCLP) framework, with alterations to reflect the environmental conditions typical of Port Harcourt, including high rainfall, humid settings, and possible soil–water interactions.

The survey data were analyzed using frequencies, percentages, means, cross-tabulations, and chi-square tests to detail menstrual pad usage, disposal methods, awareness levels, and relationships among relevant variables. Laboratory findings were summarized using concentrations of pollutants and comparative analysis between the three menstrual pad brands. Analysis of Variance (ANOVA) was applied where relevant to evaluate differences in pollutant levels across brands.

Predicted leachate concentrations were compared to the relevant WHO drinking-water standards to assess risks of water contamination.

Environmental risk was analyzed via the Enrichment Factor (EF), Contamination Factor (CF), and Potential Ecological Risk Index (PERI). The EF was applied to evaluate the extent of metal enrichment in relation to background levels, while the CF assessed the contamination degree of each specific metal. The PERI combined both contamination levels and the toxicological response factors of the metals to estimate their potential ecological impacts. Risk classifications adhered to established criteria documented in environmental risk assessment literature.

Potential contamination of water was assessed by analyzing the leaching of pollutants from the ash produced by incineration, employing pollutant-specific leaching fractions guided by the TCLP framework. The obtained concentrations were then juxtaposed with the World Health Organization's drinking-water standards for contaminants such as cadmium, lead, chromium, zinc, arsenic, and phenol. Additionally, polycyclic aromatic hydrocarbons were examined for their potential as contaminants, although no WHO drinking-water guideline was referenced when a specific guideline value was absent. The evaluation of public health risks considered possible exposure via the consumption of contaminated water and soil or dust, inhalation of airborne particles and emissions from burning, and skin contact with ash. Estimates of exposure doses were derived using standard parameters related to ingestion and inhalation, which encompassed intake rates, frequency of exposure, duration of exposure, body mass, and averaging periods. The assessment of non-carcinogenic risks employed the Hazard Quotient (HQ) and Hazard Index (HI), where values below one suggested negligible risk, and those equal to or exceeding one were seen as a potential issue. Carcinogenic risks were calculated using established cancer slope factors relevant to the pollutants and were contrasted with the generally accepted risk range of 10^{-6} to 10^{-4} . The credibility and dependability of the findings were maintained through professional evaluation and preliminary testing of the questionnaire, consistent field methodologies, and the application of validated laboratory testing processes. Quality assurance in the laboratory encompassed equipment calibration, usage of certified reference materials, repeated analyses, and suitable contamination mitigation measures. The synthesis of findings from surveys, laboratories, environmental risk assessments, and public health risks through triangulation allowed for a thorough analysis of the repercussions of menstrual pad ash disposal within the Port Harcourt Metropolis.

Results

1 Objective One: Brands, Disposal Practices and Awareness of Environmental Impacts

Table 1: Percentage Distributions of Brands, Disposal Practices and Awareness of Environmental Impacts

Variable/Indicator Examined	Frequency (n)	Percentage (%) / Result
LadyCare	91	24.4
Molped	73	19.5
Softcare	54	14.6
Always	45	12.2
Bisense	18	4.9
Others	91	24.4

	Variable/Indicator Examined	Frequency (n)	Percentage Result (%) /
Disposal practices			
	Municipal waste collection	198	53.2
	Burning	73	19.5
	Dumping in open spaces	49	13.1
	Flushing in toilets	27	7.3
	Burying	9	2.4
	Other	16	4.4
Reasons for disposal method choice			
	Convenience	108	29.0
	Privacy	86	23.1
	Lack of alternatives	74	19.9
	Cultural reasons	42	11.3
	Other	62	16.7
Awareness of environmental pollution			
	Yes	298	80.1
	No	74	19.9
Types of pollution identified*			
	Air pollution	157	42.1
	Microplastic pollution	147	39.5
	Soil contamination	98	26.3
	Water contamination	58	15.6
	Other	10	2.7

*Multiple responses permitted

**Percentage calculated based on total respondents (n = 372)

Source: Field Survey, 2026

Table 2: Percentage Distributions of Brands, Disposal Practices and Awareness of Environmental Impacts

	Options	Percent(%)	
Belief in public-health impacts			
	Yes	354	95.1
	No	18	4.9
Perceived health impacts*			
	Blockages in sewage systems	248	66.7
	Waterborne diseases from dumping	181	48.7

	Respiratory problems from burning	95	25.6
	Other	12	3.2
Adequacy of disposal facilities			
	Yes	73	19.5
	No	299	80.5
Preferred disposal method			
	Biodegradable pads	145	39.0
	Incineration	136	36.6
	Segregated waste collection	82	22.0
	Other	9	2.4
Recommendations for improved management*			
	Provide community incinerators	182	48.8
	Promote biodegradable pads	154	41.5
	Increase awareness campaigns	127	34.1
	Improve municipal waste collection	91	24.4
	Other	8	2.2

*Multiple responses permitted

**Percentage calculated based on total respondents (n = 372)

Source: Field Survey, 2026

Table 1 displays the distribution of participants based on the brands of menstrual pads utilized, their methods of disposal, their reasons for choosing specific disposal practices, and their understanding of the environmental and health ramifications connected with menstrual waste. The data was derived from 372 participants. For Brands of menstrual pads, the findings indicate that LadyCare and the category others were the most mentioned brands, each cited by 91 participants (24.4%). This was succeeded by Molped, reported by 73 participants (19.5%), and Softcare, mentioned by 54 participants (14.6%). Always had 45 participants (12.2%) reporting its use, while Bisense emerged as the least favored brand, with 18 participants (4.9%). The results highlight a significant diversity in the brands of menstrual pads utilized by participants, with no single brand clearly dominating the preferences among those surveyed. Disposal practices. Regarding disposal practices, municipal waste collection was the most common method, used by 198 participants (53.2%). It was followed by burning (19.5%), discarding in open areas (13.1%), toilet flushing (7.3%), other methods (4.4%), and burying (2.4%). While a majority opted for municipal waste collection, a noteworthy number of participants employed methods like burning, open dumping, and flushing. These practices could pose environmental risks, especially if menstrual waste is improperly handled or discarded. Reasons for disposal method choice. The primary motivation for selecting a specific disposal method was convenience, cited by 108 participants (29.0%). Following this were privacy (23.1%), lack of alternatives (19.9%), other reasons (16.7%), and cultural factors (11.3%). This indicates that disposal practices are primarily shaped by practical needs and the availability of proper disposal options rather than solely by environmental concerns. Awareness of environmental pollution, A significant majority of participants, 298 (80.1%), acknowledged that the disposal of menstrual waste can lead to environmental pollution, while 74

participants (19.9%) stated they were unaware of this issue. Among the different forms of pollution identified, air pollution was the most recognized, reported by 157 participants (42.1%), followed closely by microplastic pollution (39.5%). Soil contamination was noted by 26.3%, and water contamination was recognized by 15.6%. Only 2.7% identified other pollution types. The percentages do not add up to 100% since multiple answers were allowed. Belief in public-health impacts. The analysis reveals a very high perception of the health implications related to the disposal of menstrual waste. Specifically, 354 participants (95.1%) believed that the disposal of menstrual waste has public health implications, in contrast to just 18 participants (4.9%) who disagreed. Among the health issues believed to be associated, blockages in sewage systems were the most frequently mentioned, reported by 248 participants (66.7%), followed by waterborne diseases due to improper disposal (48.7%) and respiratory issues from burning (25.6%). These responses indicate that participants generally recognized the link between improper disposal of menstrual waste and associated environmental and public health issues. Adequacy of disposal facilities. Despite a relatively high level of awareness regarding environmental and health issues, only 73 respondents (19.5%) felt the current facilities for menstrual waste disposal were sufficient, whereas 299 respondents (80.5%) considered them insufficient. This reflects a significant disparity between awareness and the availability of suitable disposal systems. For Preferred disposal methods, the most favored option was biodegradable pads, chosen by 145 participants (39.0%), followed closely by incineration (36.6%) and segregated waste collection (22.0%). Merely 2.4% opted for alternative methods. The inclination towards biodegradable pads and incineration indicates that participants were open to disposal methods that could help lessen the ecological impact caused by traditional menstrual pads. Recommendations for improved menstrual-waste management, the recommendation most frequently mentioned was the introduction of community incinerators, suggested by 182 respondents (48.8%). This was succeeded by the promotion of biodegradable pads (41.5%), heightened awareness initiatives (34.1%), and better municipal waste collection (24.4%). A minor portion (2.2%) proposed other solutions. This data reveals that participants support both structural and behavioral changes to enhance menstrual-waste management. The research highlights the various brands of menstrual pads utilized, disposal methods, and knowledge regarding the environmental consequences of menstrual waste disposal. The results indicate that respondents used multiple brands of menstrual pads, with LadyCare and several others making up the largest shares. Although municipal waste collection was the primary disposal method, the ongoing use of burning, open dumping, and flushing signifies the existence of environmentally harmful disposal practices. Significantly, the results exhibit a strong awareness of environmental and public health issues among respondents. Eighty percent acknowledged the environmental pollution linked to menstrual waste, while 95.1% recognized the potential effects on public health. Despite this awareness, it did not consistently translate into appropriate disposal practices, as a considerable number still engaged in burning, open dumping, and flushing. Moreover, 80.5% indicated that disposal facilities were insufficient, implying that improper disposal may be influenced partly by infrastructural deficiencies rather than solely a lack of knowledge. The findings suggest that while respondents have substantial awareness regarding the environmental and health risks tied to menstrual-waste disposal, a significant disconnect exists between awareness and correct disposal behaviors. Therefore, the findings highlight the necessity for enhanced menstrual-waste management infrastructure, accessible municipal waste collection systems, promotion of eco-friendly menstrual products, community-based disposal facilities, and ongoing education on environmental health.

Table 2: Percentage Distribution of the Summary of Monthly and Annual Menstrual Pad Generation in Port Harcourt Metropolis

Indicator/Parameter	Category/Measure	Frequency (n)	Percentage (%)	Estimated/Calculated Value
Pads used per menstrual cycle	1–5 pads	100	26.8	—
	6–10 pads	136	36.6	—
	11–15 pads	91	24.4	—
	Above 15 pads	45	12.2	—
	Total	372	100.0	—
Pads used per month	1–10 pads	236	63.4	—
	11–20 pads	100	26.8	—
	21–30 pads	36	9.8	—
	Above 30 pads	0	0.0	—
	Total	372	100.0	—
Monthly pad usage estimate	Mean pads per woman per month	—	—	12 pads
Population-level generation	Estimated female population (15–49 years)	—	—	949,000 women
	Total monthly pad generation	—	—	11,388,000 pads
	Total annual pad generation	—	—	136,656,000 pads

Source: Field Survey, 2026; Researcher's Compilation, 2026.

The consolidated results in Table 2 show the pattern and estimated magnitude of menstrual pad generation among women of reproductive age in Port Harcourt Metropolis. Regarding pad usage per menstrual cycle, the largest proportion of respondents (36.6%) reported using 6–10 pads per cycle, followed by 26.8% who used 1–5 pads and 24.4% who used 11–15 pads. A further 12.2% reported using more than 15 pads per cycle. This indicates considerable variation in menstrual pad consumption, with a substantial proportion of respondents falling within the moderate-to-high usage categories.

For monthly usage, most respondents (63.4%) reported using 1–10 pads per month, while 26.8% used 11–20 pads and 9.8% used 21–30 pads. None of the respondents reported using more than 30 pads per month. The calculated mean monthly usage was 10.14 pads per woman, which was rounded to approximately 10 pads. However, considering possible under-reporting within the 1–10 category and variation in menstrual flow, an estimated 12 pads per woman per month was adopted for population-level extrapolation. Using an estimated 949,000 females aged 15–49 years in Port Harcourt Metropolis and an estimated average consumption of 12 pads per woman per month, the study estimated a total generation of approximately 11,388,000 menstrual pads per month. This corresponds to an estimated 136,656,000 pads annually. The estimated volume represents a substantial municipal waste stream. When considered alongside the reported unsafe

disposal practices and the perception that adequate disposal facilities are lacking, the findings suggest that menstrual pad waste constitutes a potentially important environmental management concern in Port Harcourt Metropolis. The implications of this volume of waste, particularly in relation to burning, open dumping, flushing and subsequent pollutant exposure, are examined further under the environmental and public-health risk assessment.

4.2 Testing of Hypothesis

H₀₁: Incinerated ash from commonly used menstrual pad brands in Port Harcourt does not contain significant concentrations of phenol, BTEX compounds, PAHs, or heavy metals exceeding safe environmental thresholds.

Table 3: Summary of Compliance of Phenol, BTEX, PAHs and Heavy Metals in Incinerated Menstrual-Pad Ash with Environmental Thresholds

Pollutant Category	Number of Brand-Pollutant Combinations	Exceedances	Exceedance Rate (%)	Decision
Heavy Metals	15 (3 brands × 5 heavy metals)	1	6.7%	Partial Reject
Phenol	3	3	100%	Reject
BTEX	15 (3 brands × 5 compounds)	0	0%	Fail to Reject
PAHs	3	3	100%	Reject
Overall	36	7	19.4%	—

Source: Compiled from Laboratory Analysis, 2026

The findings indicate that from the evaluation of 36 combinations of pollutants and brands, 7 (19.4%) surpassed the established environmental threshold limits, while the remaining 80.6% adhered to the regulatory standards. BTEX compounds showed no exceedances (0%), which reflects total adherence to the accepted safe limits for volatile aromatic hydrocarbons. The exceedance for heavy metals was slight (6.7%), with only one notable case of concern, suggesting a generally low yet not negligible risk of contamination. Conversely, phenol and PAHs demonstrated full exceedances (100%) across all brands, indicating a consistent failure to meet the EGASPIN target limits for these specific pollutant groups.

Considering the overall data, the null hypothesis is dismissed, as the widespread exceedances—especially for phenol and PAHs—indicate that ash from incinerated menstrual pads contains pollutants that exceed the safe environmental thresholds in important categories.

H₀₁: There is no significant relationship between respondents' awareness of the environmental impacts of menstrual pad waste and their disposal practices.

Table 4: Cross-Tabulation of Respondents' Awareness of Environmental Impacts by Menstrual-Pad Disposal Practices (n = 372)

Disposal Method	Aware (n)	Not Aware (n)	Total (n)
Burning	52	21	73
Burying	5	4	9
Municipal waste collection	174	24	198
Flushing in toilets	18	9	27
Dumping in open spaces	32	17	49
Other	13	3	16
Total	294	78	372

Source: Field Survey, 2026

The findings indicate that many survey participants recognized the effects on the environment (294; 79.0%), whereas a lesser amount did not acknowledge these impacts (78; 21.0%). Among both segments of respondents, the predominant method of waste disposal was municipal collection, succeeded by incineration and disposal in unregulated areas.

Nevertheless, harmful practices such as incineration, flushing items down toilets, and indiscriminate dumping were still noted among those who acknowledged environmental issues, suggesting that awareness alone does not fully prevent improper waste disposal. This implies that additional factors like convenience, availability of waste management services, and personal habits might play a role in determining how waste is discarded. While the table illustrates distribution trends, the determination of the hypothesis relies on the outcome of the chi-square analysis reported in the research ($\chi^2 = 22.88$, $df = 5$, $p < 0.05$), which shows that there is a statistically meaningful correlation. Consequently, the null hypothesis is dismissed, affirming that the participants' recognition of environmental consequences has a significant effect on their methods of waste disposal.

Discussion of The Findings

Table 4.1 outlines the variation in menstrual pad brands, methods of disposal, reasons for chosen disposal practices, and the level of environmental awareness regarding menstrual pad waste, as reported by 372 participants in Port Harcourt Metropolis. The results indicate a wide range of menstrual pad brands in use, with LadyCare and "Others" each comprising 24.4%. They are followed by Molped at 19.5% and Softcare at 14.6%, whereas Bisense is the least utilized brand at 4.9%. This trend highlights a fragmented marketplace with no leading brand preference, which corresponds with the diversity among consumers noted in menstrual hygiene research conducted in urban areas of Africa, where selection of brands is driven more by cost and availability than loyalty (Oche et al., 2018; Sommer et al., 2020).

In terms of disposal methods, the main practice reported was municipal waste collection at 53.2%, succeeded by burning at 19.5%, open dumping at 13.1%, flushing at 7.3%, and burying at 2.4%. Although the predominant method is formal waste collection, the ongoing use of harmful disposal practices such as burning, dumping, and flushing indicates a lack of adequate infrastructure for

menstrual waste management. Similar observations were made by Das et al. (2015) in India and Oche et al. (2018) in Nigeria, where insufficient access to gender-sensitive sanitation solutions continued to drive unsafe disposal behaviors in spite of awareness. The choice of disposal methods was mainly influenced by convenience (29.0%), then privacy (23.1%), and insufficient alternatives (19.9%). This reveals that the choices surrounding disposal are predominantly affected by structural and practical limitations rather than environmental awareness. This is consistent with findings from Sommer et al. (2015), who asserted that menstrual hygiene methods in resource-limited environments are greatly shaped by the ease of use and lack of disposal options as opposed to ecological knowledge. Concerning environmental consciousness, 80.1% of participants recognized that menstrual waste contributes to pollution, with air pollution (42.1%) and microplastic contamination (39.5%) cited as the primary effects. Nonetheless, this level of awareness did not fully result in safe disposal behaviors, indicating a “gap between awareness and practice,” aligning with findings from Phillips-Howard et al. (2016), who observed that mere knowledge does not suffice to alter menstrual hygiene practices without necessary infrastructural backing. Health perceptions were notably high, with 95.1% believing that menstrual waste is a public health concern, particularly regarding sewage blockages (66.7%) and waterborne illnesses (48.7%). Despite this, 80.5% of participants mentioned the lack of proper disposal facilities, underscoring that behaviors linked to environmental risks are mainly driven by structural issues.

Conclusion

The research revealed that the management of menstrual pad waste in Port Harcourt Metropolis raises both ecological and behavioral issues. Laboratory investigations provide empirical data that indicate the ash from incinerated menstrual pads contains significant amounts of phenol and polycyclic aromatic hydrocarbons (PAHs) in all the brands examined, with these substances often exceeding permissible environmental limits. Although BTEX compounds generally adhered to safety standards and heavy metals were only slightly over the limits, the detection of persistent organic pollutants suggests that the incineration of menstrual pads releases considerable toxic risks into the surrounding environment.

From a behavioral perspective, many respondents acknowledged the environmental and health implications linked to the disposal of menstrual waste; however, this understanding did not always lead to safe environmental actions. A considerable number of individuals continued to burn, dispose of in open areas, and flush used pads, primarily due to convenience, lack of alternatives, and insufficient disposal facilities. Additionally, the statistical analysis reaffirmed that awareness plays a crucial role in shaping disposal habits, signifying that mere knowledge is inadequate without the presence of effective waste management systems. In summary, the waste produced from menstrual pads in the research area represents an increasing environmental pollutant burden and poses a public health issue due to the inadequate methods of disposal.

Recommendations

1. It is essential for governmental bodies and environmental organizations to establish accessible and well-regulated disposal solutions for menstrual waste. This includes providing designated sanitary waste bins and managing municipal incinerators equipped with pollution control technologies to mitigate the release of harmful substances such as phenols and PAHs.

2. Efforts should be made to promote the use of biodegradable menstrual products and to intensify ongoing public education initiatives that focus on safe disposal methods. Such campaigns should particularly address the knowledge-practice gap, stressing not just awareness but also practical alternatives and support for behavioral changes.

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