

# Ritual Fear, Informal Knowledge and the Belief-Practice Gap in Menstrual Waste Disposal: A Cross-Sectional Survey in Urban Nigeria

Sarah Funmilayo Kuponiyi

sarahkuponiyi@gmail.com

Binghamton University

Omoye Akhagba

Collegium Civitas

Juliet A. Nwafor

Heriot-Watt University

Samuel Anthony Itodo

Supply Chain Research and Innovation Hub

---

## Research Article

**Keywords:** Menstrual waste management, menstrual hygiene management, disposal practices, Nigeria, socio-cultural factors, ritual fear, belief-practice gap, public health, waste infrastructure, sustainable menstrual products

**Posted Date:** June 16th, 2026

**DOI:** <https://doi.org/10.21203/rs.3.rs-9997974/v1>

**License:**   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

**Additional Declarations:** No competing interests reported.

---

# Ritual Fear, Informal Knowledge and the Belief-Practice Gap in Menstrual Waste Disposal: A Cross-Sectional Survey in Urban Nigeria

Sarah Funmilayo Kuponiyi<sup>1\*</sup>, Omoye Akhagba<sup>2</sup>, Juliet A. Nwafor<sup>3</sup>, Itodo Samuel Anthony<sup>4</sup>

<sup>1</sup> College of Community and Public Affairs, State University of New York at Binghamton, Binghamton, USA

<sup>2</sup> Institute of Sociology, Civitas University, Warsaw, Poland

<sup>3</sup> School of Social Science, Heriot-Watt University, Edinburgh, UK

<sup>4</sup> Supply Chain Research and Innovation Hub, Abuja, Nigeria

\*Corresponding author: Sarah Funmilayo Kuponiyi. Email: sarahkuponiyi@gmail.com

## Abstract

**Background:** Menstrual hygiene management (MHM) and waste disposal practices remain critical yet under-researched public health issues in Nigeria. Despite comprising a significant proportion of the Nigerian population, menstruating individuals, particularly those in low-income, rural, and institutionally bounded settings, continue to face inadequate infrastructure, socio-cultural barriers, and insufficient education for safe and sustainable menstrual waste management. This study provides a multi-regional, cross-demographic empirical account of what Nigerian menstruators do with their waste, the factors shaping their choices, and the informal knowledge systems and institutional frameworks governing those decisions.

**Methods:** A structured questionnaire survey was administered to 120 menstruating individuals aged 15–50 years across urban, semi-urban, and rural locations in Nigeria. Participants were recruited using purposive sampling to ensure inclusion of diverse age groups, occupational categories, and income levels. Data were collected on menstrual product use, disposal practices, influencing factors, hygiene knowledge, and perceptions of local waste management infrastructure. Descriptive statistical analysis and chi-square tests of independence were applied. Ethical approval was obtained from the relevant institutional review board.

**Results:** Disposable sanitary pads were used exclusively by 85.8% of respondents. Wrapping and discarding in the general household bin (50.8%) and burning (38.3%) were the most common disposal methods. Notably, 32.5% of respondents cited fear of ritual use of menstrual waste as a factor influencing disposal choice, a culturally specific Nigerian phenomenon. Only 35.8% of respondents were very familiar with correct disposal methods, and 50% were uncertain whether their current disposal method was the best option. Chi-square analysis revealed no statistically significant associations between socio-demographic variables and disposal behaviours, consistent with the limited demographic heterogeneity of the sample. Noticeably, respondents who described themselves as very familiar with correct disposal had the highest rate of unsafe actual disposal (63.0%), providing strong evidence for the belief-practice gap. Mothers were the primary source of disposal knowledge (55.8%), with school teachers cited by only 10% of respondents.

**Conclusions:** Menstrual waste management in Nigeria is constrained by a narrow definition of menstrual hygiene that excludes waste disposal, socio-cultural anxieties, including ritual fear, and structural infrastructure failures. The contradiction that greater familiarity with correct methods correlates with higher rates of unsafe disposal underscores that knowledge-only interventions are insufficient. Effective solutions require coordinated action across government, education, civil society, and the private sector.

**Keywords:** Menstrual waste management, menstrual hygiene management, disposal practices, Nigeria, socio-cultural factors, ritual fear, belief-practice gap, public health, waste infrastructure, sustainable menstrual products

## Introduction

Menstrual hygiene management (MHM) and waste disposal practices are significant public health issues, particularly in developing countries like Nigeria. Despite women and girls constituting a substantial proportion of Nigeria's population, menstrual waste management remains critically neglected, compounded by socio-cultural stigma, inadequate infrastructure, and insufficient education [1,2,19]. A systematic narrative review of menstrual health and hygiene across Nigeria, Ghana, Liberia and The Gambia confirmed these persistent barriers, documenting that inadequate menstrual hygiene practices, limited access to affordable menstrual products, insufficient WASH infrastructure, and weakly integrated educational support systems continue to undermine the health, education and social participation of girls and women across West Africa [20]. Several studies highlight the widespread lack of knowledge and awareness about menstrual hygiene, particularly among adolescent girls. A survey conducted in Ile-Ife, Nigeria, emphasized the critical gap in understanding basic menstrual hygiene practices among schoolgirls, noting that many were unaware of proper practices, leading to unsanitary behaviors such as prolonged use of sanitary pads or improper cleaning of reusable materials [1].

Cultural beliefs and practices play a crucial role in shaping menstrual hygiene behaviors. In rural areas of Nigeria, menstruation is often surrounded by secrecy and stigma. Narrative reviews have highlighted that many girls and women in these regions adhere to traditional beliefs that view menstruation as impure, leading to isolation practices and reluctance to seek proper sanitary products [1,2,5]. Across West Africa, cultural taboos and deeply entrenched negative social attitudes toward menstruation contribute to silence, self-imposed restrictions, and exclusion from social and educational activities [20]. Importantly, knowledge gaps related to menstruation are not confined to adolescents; they persist among university students, indicating that awareness does not automatically translate into comprehensive understanding or safe practice [20]. A study in Malawi examined the intersection of power, danger, and secrecy in menstrual waste management, revealing that the fear of exposure and shame drives women to adopt unsafe disposal methods such as burying or burning menstrual materials in secrecy [5,9].

The lack of adequate infrastructure is a significant barrier to effective menstrual waste management in Nigeria. A study conducted in Gwagwalada, Abuja, highlighted the absence of basic sanitary facilities including water, soap, and private spaces for changing and disposing of menstrual products with women resorting to inappropriate disposal methods such as flushing or discarding in open spaces [6]. The review by Kuponiyi and Amubode (2026) corroborates these

findings at a regional scale, identifying inadequate school WASH facilities and limited institutional support as structural determinants of poor MHH management across Nigeria and neighbouring West African countries [20]. The environmental impact of improper disposal is substantial: non-biodegradable sanitary products, used by approximately 36% of menstruators globally, have decomposition periods of 500–800 years [8], while burning and burying of menstrual waste release harmful toxins affecting both soil and water quality [3].

Globally, the evidence base on MHM has grown considerably over the past decade. Rossouw and Ross (2021) demonstrate through concentration-index analysis of PMA2020 data from eight low- and middle-income countries that wealth-related inequality in MHM is consistent and statistically significant, with the poorest women least likely to access private, lockable MHM spaces and sanitary pads [11]. In Nigeria specifically, the corrected concentration index for the inability to lock MHM spaces is among the highest in their entire dataset. Similarly, van Eijk et al. (2016), in a systematic review and meta-analysis of over 97,000 adolescent girls in India, find that cultural and religious restrictions during menstruation affect approximately 77% of girls and have not declined over a fifteen-year study window [10]. These findings frame inadequate menstrual waste management not as a cultural curiosity or individual failure, but as a measurable consequence of socio-economic inequality operating through structural channels.

Within the Nigerian literature, Adekunle and Ajayi (2019) provide the most directly relevant empirical evidence, demonstrating that while 75.8% of their sample were aware of the environmental implications of improper disposal, burning and flushing remained dominant practices [12]. They identify educational qualification as the significant sociodemographic predictor of disposal attitudes and argue that informal knowledge transmission dominated by older women who themselves received inadequate education perpetuates disposal norms intergenerationally. More recently, Ikogho and Onoharigho (2025), surveying 413 first-year female students in NDDC-built hostels, found that 96.4% bury menstrual waste in pits and 61.7% resort to burning, despite access to designated disposal bins [13]. Comparable patterns were reported by Nwoye (2024) among female students in colleges of education in Anambra State [14]. Despite growing evidence, these Nigerian empirical studies remain confined to single regions or institutionally bounded populations, reinforcing the need for broader, nationally scoped research such as the multi-country systematic review by Kuponiya and Amubode (2026) [20].

However, these Nigerian empirical studies are confined to single regions, single institution types, or demographically narrow student populations. No study has examined menstrual waste disposal practices among adult menstruators across multiple Nigerian regions, settlement types, and income groups simultaneously. Furthermore, the culturally specific phenomenon of ritual fear as a driver of disposal behaviour has not been systematically measured in primary survey data. This study addresses these gaps through a structured questionnaire survey of 120 menstruating individuals across urban, semi-urban, and rural locations in Nigeria, covering diverse age groups and income categories.

The study aligns with the Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being), SDG 5 (Gender Equality), and SDG 6 (Clean Water and Sanitation). Framing MHH as both a public health and human rights issue as articulated by Kuponiya and Amubode (2026) and the global agenda review of Sommer et al. (2021) underscores the obligation of governments, educational institutions and civil society organisations to ensure that

all menstruators can manage their health with dignity [15,16,20]. This study responds to the research priorities articulated by Phillips-Howard et al. (2016) by generating primary, nationally scoped data with standardised measures on disposal practices among an adult Nigerian population [15].

## ***Objectives***

The study aims to:

1. Explore existing menstrual waste management and disposal practices among menstruators in Nigeria.
2. Identify socio-cultural factors that influence menstrual waste management and disposal practices.
3. Assess the infrastructural challenges and gaps in menstrual waste management and disposal.
4. Examine the environmental and health implications of current menstrual waste management practices.
5. Understand perceptions and attitudes towards sustainable and hygienic menstrual waste management practices across geographical areas.

## ***Research Questions***

- What is the definition of menstrual hygiene among menstruators in Nigeria?
- How do menstruators maintain personal hygiene during menstruation?
- How do menstruators in Nigeria manage and dispose of their menstrual waste?
- What factors influence the choice of menstrual waste disposal method?
- What are the environmental and health implications of current menstrual waste management practices in Nigeria?
- What are the perceptions of individuals on general waste management in their locations?

## **Methods**

### ***Study Design and Setting***

This study adopted a cross-sectional survey design to investigate menstrual waste management and disposal practices among menstruating individuals in Nigeria. The study was conducted across Nigeria, a country with diverse socio-cultural, economic, and environmental contexts that influence menstrual waste management. The geographical scope ensured the inclusion of participants from different regions, representing varying levels of urbanization, education, and socio-economic status.

### ***Study Population and Sampling***

The study population comprised individuals who menstruate across Nigeria. A purposive sampling technique was applied to recruit participants from diverse age groups (15–50 years), occupations,

and socio-economic backgrounds. This approach was designed to provide a comprehensive understanding of menstrual waste management and disposal practices within Nigeria, while acknowledging the resultant limitations in representativeness discussed in the Limitations section.

### ***Data Collection Instrument***

A structured questionnaire was administered to gather quantitative data. The questionnaire comprised sections on: (i) demographic characteristics (age, geographic location, education level, monthly income); (ii) definition and personal practices of menstrual hygiene; (iii) menstrual product usage; (iv) disposal methods and perceived best practices; (v) factors influencing disposal choice; (vi) knowledge source and transmission; and (vii) perceptions of local waste management infrastructure. Questions were primarily close-ended to facilitate analysis of responses, with a small number of open-ended items to capture additional qualitative insights. Ethical approval was obtained from the relevant institutional review board. Informed consent was obtained from all participants prior to participation. Participants were assured of confidentiality and anonymity, and participation was entirely voluntary.

### ***Data Analysis***

Data collected through the questionnaires were analyzed using descriptive statistical methods. Frequency distributions, percentages, and mean values were used to summarise responses. The analysis focused on identifying patterns and trends in menstrual waste management and disposal practices. Results are presented in tabular form. A discrepancy identified in the raw data for perceived best disposal methods (wrapping and binning recorded as 60% against an observed frequency of  $48/120 = 40\%$ ) was corrected; the figure of 40% is used throughout this report. Multi-select questions are reported with percentages based on  $N = 120$  rather than the sum of responses, as respondents could select multiple items. Chi-square tests of independence were additionally conducted to examine associations between socio-demographic variables (education level and income) and key behavioural outcomes (disposal method safety, ritual fear as a disposal driver, and familiarity with correct disposal methods). Cramér's V was calculated as a measure of effect size for each test, with statistical significance set at  $p < 0.05$ .

## **Results**

### ***Sample Profile***

A total of 120 menstruating females aged 15–50 years participated in the study.

This is the socio-demographic profile snapshot, while details are presented in Tables 1–4.

Socio-demographic profile of 120 survey respondents on menstrual waste management in Nigeria

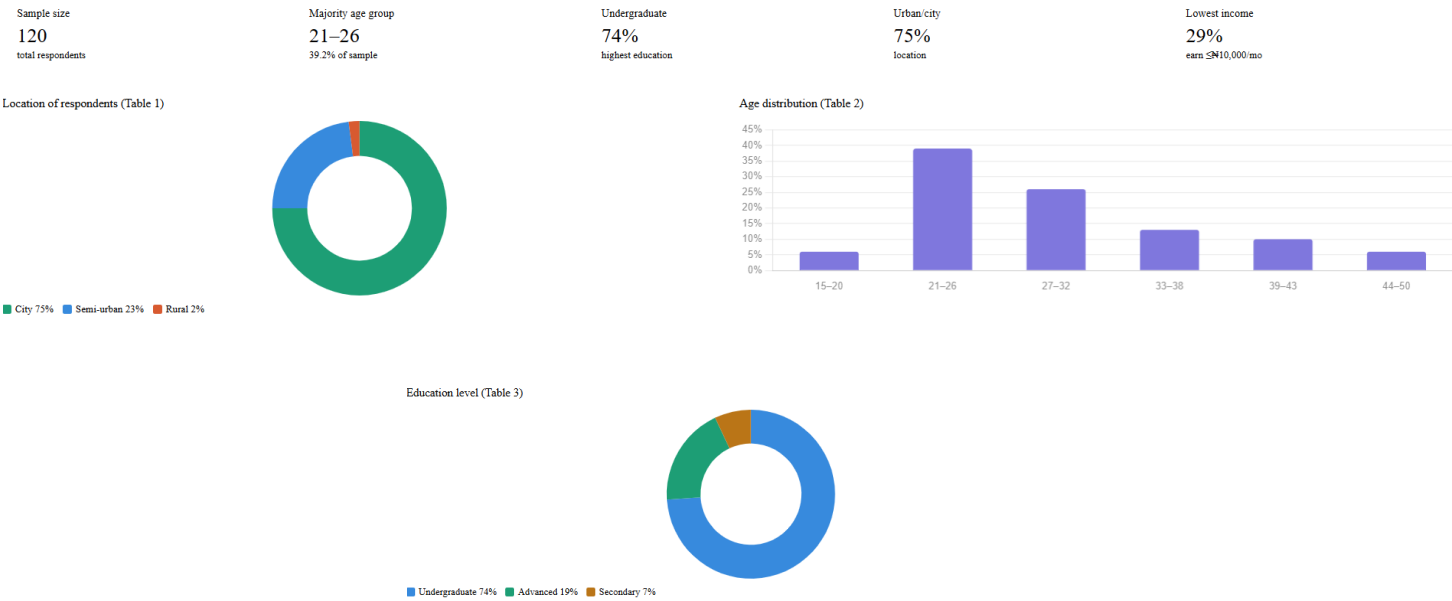


Table 1. Geographic distribution of respondents (N = 120)

| Location   | Frequency (n) | Percentage (%) |
|------------|---------------|----------------|
| City       | 90            | 75.0           |
| Semi-urban | 28            | 23.3           |
| Rural      | 2             | 1.7            |
| Total      | 120           | 100.0          |

Table 2. Age distribution of respondents (N = 120)

| Age group (years) | Frequency (n) | Percentage (%) |
|-------------------|---------------|----------------|
| 15–20             | 7             | 5.8            |
| 21–26             | 47            | 39.2           |
| 27–32             | 31            | 25.8           |
| 33–38             | 16            | 13.3           |
| 39–43             | 12            | 10.0           |
| 44–50             | 7             | 5.8            |
| Total             | 120           | 100.0          |

Table 3. Educational attainment of respondents (N = 120)

| Education level               | Frequency (n) | Percentage (%) |
|-------------------------------|---------------|----------------|
| Secondary/Vocational          | 14            | 11.7           |
| Undergraduate                 | 89            | 74.2           |
| Advanced (Master's or higher) | 23            | 19.2           |
| Total                         | 120           | 100.0          |

**Table 4.** Monthly income distribution of respondents (N = 120)

| Income bracket (₦/month)    | Frequency (n) | Percentage (%) |
|-----------------------------|---------------|----------------|
| Low (₦0–10,000)             | 57            | 47.5           |
| Lower-Mid (₦10,000–50,000)  | 34            | 28.3           |
| Upper-Mid (₦50,000–100,000) | No data       | —              |
| High (₦100,000+)            | 34            | 28.3           |
| Total                       | 120           | 100.0          |

### ***Research Question 1: Definition of Menstrual Hygiene***

Respondents overwhelmingly defined menstrual hygiene in terms of personal bodily care rather than waste management (Table 5). Changing products at least twice daily was endorsed by 93.3% of respondents, and 85.0% included bathing at least twice daily. In contrast, disposing of products in a dustbin was the only disposal-related item presented was selected by only 65.8% of respondents. This gap is significant: proper waste disposal is not yet conceptualised as a core component of menstrual hygiene by the majority of this sample. This finding is consistent with the regional evidence reported by Kuponiyi and Amubode (2026), who found that awareness of menstruation does not necessarily translate into a comprehensive understanding of hygienic practices, including waste disposal [20].

**Table 5.** Respondents' definitions of menstrual hygiene (N = 120; multi-select)

| Definition element                   | Frequency (n) | Percentage (%) |
|--------------------------------------|---------------|----------------|
| Change products at least twice daily | 112           | 93.3           |
| Take a shower at least twice daily   | 102           | 85.0           |
| Use water to wash intimate area      | 89            | 74.2           |
| Dispose of products in the dustbin   | 79            | 65.8           |

### ***Research Question 2: Personal Hygiene Practices During Menstruation***

Actual hygiene practices during menstruation were relatively consistent across all four measures (Table 6). Changing products regularly (77.5%) and properly disposing of used products (76.7%)

ranked highest. Handwashing before and after changing products (73.3%) and keeping the genital area clean and dry (67.5%) were lower the latter being of particular medical importance as a primary factor in preventing reproductive tract infections. Notably, more than one-quarter of respondents do not regard regular handwashing as an essential routine during menstruation, suggesting a gap with implications for infection prevention.

**Table 6.** Personal hygiene practices during menstruation (N = 120; multi-select)

| Personal hygiene practice                  | Frequency (n) | Percentage (%) |
|--------------------------------------------|---------------|----------------|
| Changing products regularly                | 93            | 77.5           |
| Properly disposing of used products        | 92            | 76.7           |
| Handwashing before/after changing products | 88            | 73.3           |
| Keeping genital area clean and dry         | 81            | 67.5           |

### ***Research Question 3: Menstrual Waste Disposal Methods***

Disposable sanitary pads were the dominant absorbent product, used exclusively by 85.8% of respondents and in combination with other methods by a further 8.3% (Table 7). Tampons were used by 4.2% of respondents, while tissue paper or cloth generally considered less hygienic, was reported by only 1.7%. These findings are broadly consistent with the regional patterns documented by Kuponiyi and Amubode (2026), who found that disposable sanitary pads were the preferred product across West Africa but that consistent access remained uneven, with prevalences of inadequate access ranging from 20% to 59% across study settings [20].

**Table 7.** Menstrual blood absorbent products used by respondents (N = 120)

| Product type                         | Frequency (n) | Percentage (%) |
|--------------------------------------|---------------|----------------|
| Disposable sanitary pads exclusively | 103           | 85.8           |
| Disposable pads with other methods   | 10            | 8.3            |
| Tampons or other hygienic options    | 5             | 4.2            |
| Tissue paper or cloth                | 2             | 1.7            |
| Total                                | 120           | 100.0          |

A notable divergence exists between perceived best disposal practice and actual disposal behaviour (Table 8). While 44.2% of respondents considered burning to be the correct method and 40.0% considered wrapping and binning correct, actual behaviour showed 50.8% wrapping and using the general household bin and 38.3% burning. Flushing waste down the toilet was reported by 15.8% of respondents, a method that risks sewage blockages and environmental contamination [6,8].

**Table 8.** Perceived best disposal method versus actual disposal practice (N = 120; multi-select)

| Disposal method                   | Perceived correct: n (%) | Actual practice: n (%) |
|-----------------------------------|--------------------------|------------------------|
| Wrap and discard in household bin | 48 (40.0%)               | 61 (50.8%)             |
| Burning                           | 53 (44.2%)               | 46 (38.3%)             |
| Separate designated bin           | 34 (28.3%)               | 24 (20.0%)             |
| Washing with soap and water       | 18 (15.0%)               | 20 (16.7%)             |
| Flushing down the toilet          | 19 (15.8%)               | 19 (15.8%)             |
| Store then dispose                | 17 (14.2%)               | —                      |

Confidence in disposal method choice was limited: 50.0% of respondents were uncertain whether their method was the best, 45.8% expressed confidence, and 5.0% explicitly rated their method as not the best. Familiarity with correct disposal methods was similarly constrained: only 35.8% considered themselves very familiar, 46.7% reported moderate familiarity, and 17.5% reported no familiarity.

#### ***Research Question 4: Factors Influencing Disposal Method Choice***

Environmental consideration was the most commonly cited factor influencing disposal choice, reported by 49.2% of respondents (Table 9). Hygiene concerns (41.7%) ranked second. Critically, 32.5% of respondents cited fear that their menstrual waste might be taken for ritual use as an influencing factor a distinctly Nigerian socio-cultural phenomenon. This finding helps explain the cultural preference for burning, as complete destruction of the waste eliminates the risk of retrieval. The absence of alternative disposal options was cited by 30.8% of respondents, underscoring the structural dimension of disposal behaviour.

**Table 9.** Factors influencing choice of menstrual waste disposal method (N = 120; multi-select)

| Influencing factor                    | Frequency (n) | Percentage (%) |
|---------------------------------------|---------------|----------------|
| Environmental consideration           | 59            | 49.2           |
| Hygiene concerns                      | 50            | 41.7           |
| Fear of ritual use of menstrual waste | 39            | 32.5           |
| Lack of alternative disposal options  | 37            | 30.8           |
| Absence of waste disposal system      | 30            | 25.0           |
| Cultural beliefs or traditions        | 14            | 11.7           |

#### **Knowledge Transmission**

Mothers were the primary source of disposal knowledge for 55.8% of respondents. A substantial proportion (40.8%) reported being self-taught, while school teachers (10%) and the internet (10%) played minimal roles. This reliance on informal, intergenerational transmission means that

inadequate practices are likely to persist across generations in the absence of structured education programmes, a finding consistent with the theoretical argument advanced by Adekunle and Ajayi (2019) [12]. The systematic review by Kuponiyi and Amubode (2026) corroborates this pattern at a regional level, finding that reliance on informal information sources is widespread and that mothers and sisters, rather than schools, constitute the primary channels of menstrual knowledge transmission across West Africa [20].

### **Socio-Demographic Associations with Disposal Behaviour: Chi-Square Analysis**

Chi-square tests of independence were conducted to examine whether education level, income, and knowledge source were associated with disposal behaviour, ritual fear, and familiarity with correct disposal methods. The result of the Chi-square test of independence is shown in Table 10. None of the eight tests reached statistical significance (all  $p > 0.05$ ), with Cramér's V effect sizes ranging from 0.087 to 0.175, indicating negligible to weak associations across all comparisons. This finding is consistent with the relatively homogeneous socio-demographic profile of the sample, which limits statistical power to detect differential effects.

**Table 10.** Chi-square tests of independence: socio-demographic variables and disposal behaviours (N = 120–125)

| Test                                               | N   | $\chi^2$ | df | p-value | Cramér's V | Effect strength | Significance |
|----------------------------------------------------|-----|----------|----|---------|------------|-----------------|--------------|
| Income × Disposal method (safe vs. unsafe)         | 125 | 0.945    | 2  | 0.623   | 0.087      | Negligible      | ns           |
| Education × Disposal method (safe vs. unsafe)      | 125 | 1.209    | 2  | 0.546   | 0.098      | Negligible      | ns           |
| Education × Ritual fear as disposal driver         | 124 | 2.530    | 2  | 0.282   | 0.143      | Weak            | ns           |
| Income × Ritual fear as disposal driver            | 124 | 2.173    | 2  | 0.337   | 0.132      | Weak            | ns           |
| Knowledge source × Disposal method                 | 125 | 1.176    | 2  | 0.556   | 0.097      | Negligible      | ns           |
| Familiarity with disposal × Actual disposal method | 125 | 3.837    | 2  | 0.147   | 0.175      | Weak            | ns           |
| Education × Familiarity with disposal              | 125 | 4.765    | 4  | 0.312   | 0.138      | Weak            | ns           |

| Test                               | N   | $\chi^2$ | df | p-value | Cramér's V | Effect strength | Significance |
|------------------------------------|-----|----------|----|---------|------------|-----------------|--------------|
| Income × Familiarity with disposal | 125 | 4.270    | 4  | 0.371   | 0.131      | Weak            | ns           |

ns = not significant ( $p > 0.05$ ). Cramér's V:  $<0.1$  negligible;  $0.1-0.2$  weak;  $0.2-0.3$  moderate;  $\geq 0.3$  strong.

Despite non-significance, descriptive trends within the contingency tables are noteworthy. Respondents with secondary or vocational education had the highest rate of unsafe disposal (64.3%) compared to those with undergraduate (52.9%) or advanced qualifications (45.8%), suggesting a directional association that may reach statistical significance in a more demographically diverse sample. Similarly, ritual fear as a disposal driver was most prevalent among the least-educated group (50.0%), compared to advanced degree holders (25.0%), though this difference did not reach significance ( $\chi^2=2.530$ ,  $df=2$ ,  $p=0.282$ , Cramér's  $V=0.143$ ).

The most striking finding from the chi-square analysis was the relationship between self-reported familiarity with correct disposal methods and actual disposal behaviour. Paradoxically, respondents who described themselves as “very familiar” with proper disposal had the highest rate of unsafe actual disposal behaviour (63.0%), compared to those who were “somewhat familiar” (50.0%) or “not familiar” (39.1%), though this pattern was not statistically significant ( $\chi^2=3.837$ ,  $df=2$ ,  $p=0.147$ , Cramér's  $V=0.175$ ). This counterintuitive finding constitutes the most direct empirical evidence in this study of the belief-practice gap: possession of correct knowledge does not translate into safe disposal behaviour, and may instead reflect a rationalisation of current practice.

### **Research Question 5: Environmental and Health Implications**

The environmental and public health consequences of improper menstrual waste disposal are documented extensively in the literature. Non-biodegradable sanitary products disposed of in landfills or water bodies contribute significantly to environmental pollution [8]. Burning or burying of menstrual waste releases harmful toxins into the environment, affecting soil and water quality [3]. Flushing menstrual products down the toilet can clog sewage systems, leading to backflow and contamination of water sources used for drinking and other domestic purposes [6,7].

The health implications are equally significant. Ikogho and Onoharigho (2025) report that among female students in NDDC-built hostels, 90.33% experienced irritation, 85.67% reported rashes, 77.33% dermatitis, and 75.33% alteration of vaginal pH secondary to improper menstrual waste practices [13]. Kuhlmann et al. (2017) cite case-control evidence from India showing that women using reusable cloths were twice as likely to have urogenital infections compared with disposable pad users [17]. These studies confirm that inadequate MHH is associated with reproductive tract infections, psychosocial distress, and increased vulnerability to infections across West African settings. The use of reusable cloth pads when not properly cleaned and dried was identified as a significant risk factor for urinary tract infections (UTIs) and reproductive tract infections (RTIs) [1,10].

### **Research Question 6: Perceptions of Local Waste Management**

The broader waste management context directly shapes menstrual waste disposal options (Table 11). Nearly half of respondents (41.7%) described waste management in their locality as poorly managed with significant challenges, and a further 10.8% reported no waste management system at all. Only 18.3% described their area as well-managed and efficient.

**Table 11.** Respondents' perceptions of local waste management (N = 120)

| Waste management rating                    | Frequency (n) | Percentage (%) |
|--------------------------------------------|---------------|----------------|
| Well-managed and efficient                 | 22            | 18.3           |
| Moderately managed with some challenges    | 35            | 29.2           |
| Poorly managed with significant challenges | 50            | 41.7           |
| No waste management system exists          | 13            | 10.8           |
| Total                                      | 120           | 100.0          |

Government and local authorities were identified as primarily responsible for waste disposal by 56.7% of respondents, while 37.5% reported managing waste individually and 15.8% cited private companies. Half of respondents (53.3%) pay for waste management services, while 33.3% do not, indicating fragmented and inconsistent provision. This infrastructural deficit is critical context for interpreting disposal data: when general waste bins are scattered by scavengers, collected infrequently, or non-existent, menstruators are structurally constrained in their disposal choices even when they possess correct knowledge.

## Discussion

This study provides the first multi-regional, cross-demographic primary survey data on menstrual waste disposal practices, influencing factors, and knowledge transmission among adult Nigerian menstruators. The findings reveal a population navigating disposal within three overlapping constraints: a narrow conceptualisation of menstrual hygiene that excludes waste management; a socio-cultural environment shaped by ritual fear and informal knowledge transmission; and structural infrastructure failures that restrict even well-intentioned behaviour.

**Menstrual hygiene definitions and the waste management gap.** The finding that only 65.8% of respondents include disposal in their definition of menstrual hygiene compared to 93.3% who include product-changing frequency suggests that menstrual hygiene education in Nigeria has been predominantly body-focused and has neglected the waste management dimension.

This aligns with the observation by Kuhlmann et al. (2017) that the menstrual hygiene and WASH literatures have developed largely in parallel without integration [17], and with Phillips-Howard et al. (2016), who identified the absence of standardised outcome definitions, including disposal-related indicators, as a persistent gap in the field [15]. The systematic narrative review by Kuponiyi and Amubode (2026) corroborates this finding at a regional level: knowledge gaps about menstruation persisted even among university students across all four countries, underscoring

that formal education alone does not guarantee comprehensive menstrual health understanding [20]. The chi-square analysis conducted in this study found no statistically significant association between education level and disposal behaviour ( $\chi^2=1.209$ ,  $df=2$ ,  $p=0.546$ ), consistent with findings by Adekunle and Ajayi (2019), who noted that educational attainment does not straightforwardly predict safe disposal practice [12].

The directional trend with secondary-educated respondents showing higher rates of unsafe disposal (64.3%) than advanced degree holders (45.8%) suggests that with a more representative and heterogeneous sample, this association may reach statistical significance. Together, these findings make a compelling case for MHM curricula to be redesigned to explicitly incorporate waste disposal as an equal component of hygiene practice.

**Disposal practices and the belief-practice divergence.** This pattern echoes broader observations in the Nigerian literature: despite reported increases in menstrual hygiene knowledge from approximately 60% to over 94% among adolescents, a persistent gap between knowledge and practice has been documented [19]. It indicates that behaviour is not simply a reflection of beliefs but is substantially shaped by structural constraints. The literature supports this interpretation: Adekunle and Ajayi (2019) found that 75.8% of their sample were aware of the environmental implications of improper disposal, yet continued burning and flushing as dominant practices [12]. Rossouw and Ross (2021) similarly demonstrate that awareness does not overcome access barriers for the poorest quintile [11]. The high rate of burning (38.3%) in an urban, educated sample confirms findings from Ikogho and Onoharigho (2025) and Nwoye (2024) that burning is not confined to rural contexts but is widespread across Nigerian educational and residential settings [13,14]. This divergence is further confirmed by the chi-square analysis: respondents who self-reported being “very familiar” with correct disposal methods had paradoxically the highest rate of unsafe actual disposal (63.0%), compared to 39.1% among those reporting no familiarity ( $\chi^2=3.837$ ,  $df=2$ ,  $p=0.147$ , Cramér’s  $V=0.175$ ). While not statistically significant, this directional pattern provides the most direct empirical evidence in this study that knowledge alone is insufficient to produce behavioural change a finding with direct implications for education-only intervention strategies.

**Ritual fear as a culturally specific driver of disposal behaviour.** The finding that 32.5% of respondents cite fear of ritual use of menstrual waste as a factor in their disposal choice is, to the authors’ knowledge, the first time this phenomenon has been directly and systematically measured in primary survey data on Nigerian menstrual waste disposal. The regional review by Kuponiyi and Amubode (2026) documents Nigerian beliefs about ritual impurity and witchcraft particularly among Igbo communities as producing self-imposed restrictions during menstruation, contributing to silence, secrecy and avoidance of open disposal [20]. While cultural taboos surrounding menstruation have been noted in the broader African literature [1,5], ritual fear specifically the belief that menstrual material can be used for malevolent spiritual purposes if retrieved by others has been theorised but never empirically quantified before this study. The present findings demonstrating that ritual fear is not merely a background cultural attitude but a measurable, active driver of specific disposal choices. The preference for burning is partly explicable by this phenomenon: complete incineration eliminates any possibility of retrieval. This finding has direct implications for disposal infrastructure: provision of lockable, private disposal

units may address this fear more effectively than educational campaigns that do not acknowledge it.

**Informal knowledge transmission and intergenerational norm reproduction.** Mothers constitute the primary knowledge source for 55.8% of respondents, while school teachers account for only 10%. This finding provides empirical corroboration for the theoretical argument advanced by Adekunle and Ajayi (2019) that informal, intergenerational transmission perpetuates inadequate disposal norms [12]. The present data extend this argument to a nationally scoped, demographically diverse adult population. This pattern is further reinforced by the regional evidence from Kuponiyi and Amubode (2026), whose systematic review found that mothers and sisters were the predominant sources of menstrual knowledge across Nigeria, Ghana, Liberia and The Gambia, while school-based MHH education remained poorly integrated and under-resourced [20]. Sommer et al. (2021) note that Nigeria does not feature among countries with functioning national-level MHM policies or evidence-informed implementation programmes [16], which means Nigerian menstruators cannot rely on institutional guidance to supplement or correct what they learned at home.

**Infrastructure as a structural constraint.** The finding that 52.5% of respondents describe local waste management as poorly managed or non-existent is consistent with the infrastructural deficit documented by Adekiya and Magaji (2022) in Gwagwalada, Abuja, and with the broader LMIC review by Elledge et al. (2018), which identified the absence of designated disposal bins, incinerators, and reliable water supply as the proximate structural determinants of unsafe disposal [6,9]. Betsu et al. (2024), reviewing sixteen intervention trials, find that combined pad-plus-education interventions outperform either component in isolation, but note that no published trial has tested the full triad of education, supplies, and improved physical environment simultaneously [18]. The present data, showing that 50.8% default to the general household bin despite expressing environmental concerns and uncertainty about their disposal method, reinforce the argument that disposal behaviour is structurally constrained: education without infrastructure cannot produce sustainable change.

**The dominance of disposable sanitary pads and sustainability implications.** The near-universal use of single-use disposable pads (85.8%) among a sample that expresses environmental concern (49.2%) suggests that sustainable alternatives are either unaffordable, inaccessible, or culturally unfamiliar. This mirrors the pattern documented by Rossouw and Ross (2021) across eight LMICs and by Bhor and Ponkshe (2018), who propose decentralised, community-based incineration as a partial solution to the volume of single-use product waste in countries lacking formal disposal systems [4,11]. The environmental burden of single-use pads is significant: Anand et al. (2022) characterise the global volume of menstrual hygiene waste as an urgent but neglected environmental and public health challenge requiring systemic policy intervention [8]. The evidence synthesis by Kuponiyi and Amubode (2026) demonstrates that multicomponent interventions combining menstrual product provision, education and WASH infrastructure improvements consistently outperform single-component approaches in improving MHH outcomes and reducing school absenteeism [20]. This regional evidence strongly supports the present study's recommendation that addressing menstrual waste management in Nigeria requires simultaneous action across all three levels: awareness, socio-cultural engagement, and infrastructure.

## Conclusion

This study provides empirical evidence that menstrual waste management in Nigeria is shaped by a compounding set of challenges: a body-focused definition of menstrual hygiene that excludes waste disposal; socio-cultural anxieties rooted in ritual fear and informal knowledge transmission; and structural infrastructure failures that constrain even well-intentioned behaviour. The finding that half of an urban, educated sample was uncertain whether their own disposal method was correct and that the majority defaulted to the general household bin despite preferring alternative methods speaks to the depth of both the knowledge and infrastructure gaps. Critically, the chi-square analysis revealed that respondents who self-identified as “very familiar” with correct disposal methods had the highest rate of unsafe actual disposal behaviour (63.0%), constituting the most direct empirical evidence in this study that knowledge alone is insufficient to drive behavioural change. These findings are further contextualised by the broader West African evidence synthesised by Kuponiyi and Amubode (2026), confirming that the barriers documented in this study reflect persistent regional patterns of socio-economic inequality, cultural stigma, and infrastructural deficit that require coordinated, multisectoral responses [20].

Meaningful progress requires coordinated action across government, civil society, healthcare, education, and the private sector. The evidence presented here supports a combination of: formal hygiene education that explicitly incorporates waste disposal as a component of MHM; culturally sensitive community engagement that directly addresses ritual-fear as a disposal driver; and provision of accessible, dedicated disposal infrastructure. Nigeria’s menstruating population deserves safe, dignified, and environmentally responsible waste management options. This study provides the empirical foundation for that commitment.

## Recommendations

### *Education and Awareness*

Given that 65.8% of respondents exclude disposal from their definition of menstrual hygiene, formal education at secondary and tertiary levels should explicitly incorporate menstrual waste disposal as a component of MHM. School teachers currently cited by only 10% as a knowledge source represent an underutilised channel. Structured MHM curricula should be developed for secondary schools, with teacher training prioritised in rural and semi-urban settings. The systematic review by Kuponiyi and Amubode (2026) provides regional evidence that educational interventions particularly peer-led and school-based programmes, can be effective in challenging harmful norms and improving hygiene practices, supporting their integration as a core strategy [20]. The 21–26 age group the largest cohort in this study is highly digitally connected; targeted social media campaigns on platforms popular with young Nigerians should be commissioned to promote proper disposal, debunk myths, and normalise open discussion of menstruation. Community-based workshops for women of all ages should be designed to update knowledge and enable mothers to pass accurate information to daughters.

### *Socio-Cultural Interventions*

The finding that 32.5% of respondents cite ritual fear as a disposal driver requires direct acknowledgement rather than dismissal. Community dialogue programmes led by trusted

religious leaders, community figures, and healthcare workers should address cultural beliefs around ritual use of menstrual waste. Provision of disposal solutions that give menstruators control over their waste such as dedicated incineration points or lockable separate bins would address the practical basis of this fear. This emphasises that addressing culturally driven barriers requires approaches that go beyond information provision alone, advocating for participatory, empowerment-focused strategies that challenge harmful norms and promote agency. Destigmatisation of menstrual waste disposal in public spaces, workplaces, and schools is essential for sustained behavioural change.

### ***Infrastructure and Policy***

Government and local authorities should mandate installation of small-scale incinerators or sanitary disposal units in public institutions, including schools, hospitals, markets, and transport hubs. Local government councils should pilot dedicated menstrual waste collection and treatment programmes in urban and semi-urban areas, with rigorous evaluation frameworks. General waste management systems must be strengthened concurrently: increased frequency and reliability of municipal waste collection, enforcement against scavenging, and investment in waste segregation infrastructure are prerequisites for meaningful improvement in menstrual waste outcomes. The evidence synthesis by Kuponiyi and Amubode (2026) demonstrates that multicomponent interventions combining product access, education and WASH improvements are most effective [20], reinforcing the need for policy frameworks that address all three domains simultaneously. Subsidies or voucher programmes to reduce the cost of reusable menstrual products for low-income menstruators should be developed, alongside national distribution programmes that include sustainable alternatives.

### ***Research Priorities***

The following research directions are recommended: a nationally representative survey with proportional sampling across urban, semi-urban, and rural areas; qualitative studies focus groups and in-depth interviews with rural menstruators, adolescents, and low-income urban women; linkage of disposal practices to measurable environmental and health outcomes including chi-square and regression analyses on a more heterogeneous national sample; evaluation of specific interventions (school-based education, community incineration, sustainable product subsidies) through controlled pilot programmes; and estimation of the economic cost of inadequate menstrual waste management to build the evidence base for government investment.

### ***Limitations***

This study has several important limitations. First, the sample is significantly skewed towards urban (75%) and highly educated (93% undergraduate or above) menstruators, substantially overestimating conditions relative to Nigeria's predominantly rural, less-educated female population. Findings, particularly those relating to hygiene awareness, product choices, and disposal knowledge, should not be generalised to rural or less-educated communities. Second, 65% of respondents fell within the 21–32 age bracket, meaning adolescents are a critical target group for MHM education, and older menstruators are significantly underrepresented.

Third, all data were self-reported via survey; social desirability bias may inflate reported rates of proper hygiene maintenance and disposal. Fourth, several survey questions allowed multiple responses, preventing the calculation of mutually exclusive percentages. Fifth, the study measures perceptions and self-reported behaviours but does not include objective environmental or health outcome data, such as actual contamination levels, infection incidence rates, or drainage blockage data. Sixth, chi-square tests of independence conducted to examine socio-demographic predictors of disposal behaviour yielded no statistically significant associations, likely reflecting the limited demographic heterogeneity of the sample: 93% of respondents held undergraduate or higher qualifications, and 75% resided in urban areas, substantially reducing the statistical power necessary to detect sociodemographic effects. A nationally representative sample with greater variation across education level, income, and geographic location would be required to test these associations reliably. Finally, as a cross-sectional study, it provides a snapshot of current practices and cannot establish temporality or causation.

## **Declarations**

### ***Ethics Approval and Consent to Participate***

This study followed the Declaration of Helsinki. This study was conducted as part of a broader research project approved by the National Health Research Ethics Committee (NHREC) of Nigeria (NHREC/01/01/2007-20/09/2024 and NHREC/01/01/2007-15/11/2024). Informed consent was obtained from all participants before participation. The data of this study were anonymised, and the manuscript has no personal data.

### ***Competing Interests***

The authors declare no competing interests.

### ***Funding***

The authors did not receive any funding or financial support from any organised body or institution for this work.

### ***Authors' Contributions***

S.F.K, O.A and J.A.N conceived the study, led data collection, and developed the manuscript, contributed to literature synthesis and manuscript revision. I.S.A. undertook formal data analysis and prepared the tables. All authors contributed to methodology and interpretation of findings. All authors read and approved the final manuscript.

### ***Availability of Data and Materials***

The data supporting the findings of this study are available within the manuscript.

## References

1. Kashyap V, Choudhari SG. Menstrual hygiene problems and challenges faced by adolescent females in rural areas: a narrative review. *Cureus*. 2023;15(6):e40438. <https://doi.org/10.7759/cureus.40438>
2. Scorgie F, Foster J, Stadler J, Phiri T, Hoppenjans L, Rees H, et al. "Bitten by shyness": menstrual hygiene management, sanitation, and the quest for privacy in South Africa. *Med Anthropol*. 2016;35(2):161–176. <https://doi.org/10.1080/01459740.2015.1094067>
3. Adewusi OA. An estimate of the budgetary allocation for environmental sanitation and hygiene practices for the realisation of Vision 20, 2020 in Adamawa State, Nigeria. *Int J Humanit Soc Sci*. 2015;5(6):185–194.
4. Bhor G, Ponkshe S. A decentralized and sustainable solution to the problems of dumping menstrual waste into landfills and related health hazards in India. *Eur J Sustain Dev*. 2018;7(3):334–341. <https://doi.org/10.14207/ejsd.2018.v7n3p334>
5. Alda-Vidal C, Browne AL. Absorbents, practices, and infrastructures: changing socio-material landscapes of menstrual waste in Lilongwe, Malawi. *Soc Cult Geogr*. 2022;23(8):1057–1077. <https://doi.org/10.1080/14649365.2021.1901974>
6. Adekiya OA, Magaji JY. Assessment of menstrual hygiene and waste disposal among women in residential neighbourhoods of Gwagwalada, Federal Capital City Abuja, Nigeria. *Ethiop J Environ Stud Manag*. 2022;15(2):172–183. <https://doi.org/10.4314/ejesm.v15i2.4>
7. Blair LAG, Bajón-Fernández Y, Villa R. An exploratory study of the impact and potential of menstrual hygiene management waste in the UK. Leicester: School of Engineering and Sustainable Development, De Montfort University; n.d.
8. Anand U, Vithanage M, Rajapaksha AU, Dey A, Varjani S, Bontempi E. Inapt management of menstrual hygiene waste (MHW): an urgent global environmental and public health challenge in developed and developing countries. *Heliyon*. 2022;8:e09859. <https://doi.org/10.1016/j.heliyon.2022.e09859>
9. Elledge MF, Muralidharan A, Parker A, Ravndal KT, Siddiqui M, Toolaram AP, et al. Menstrual hygiene management and waste disposal in low and middle income countries—a review of the literature. *Int J Environ Res Public Health*. 2018;15(11):2562. <https://doi.org/10.3390/ijerph15112562>
10. van Eijk AM, Sivakami M, Thakkar MB, Bauman A, Laserson KF, Coates S, et al. Menstrual hygiene management among adolescent girls in India: a systematic review and meta-analysis. *BMJ Open*. 2016;6(3):e010290. <https://doi.org/10.1136/bmjopen-2015-010290>
11. Rossouw L, Ross H. Understanding period poverty: socio-economic inequalities in menstrual hygiene management in eight low- and middle-income countries. *Int J Environ Res Public Health*. 2021;18(5):2571. <https://doi.org/10.3390/ijerph18052571>
12. Adekunle O, Ajayi E. Assessment of menstrual waste disposal and the environment: the role of adult education in Nigeria. *Am Int J Soc Sci Res*. 2019;4(2):78–87. <https://doi.org/10.46281/aijssr.v4i2.350>
13. Ikogho DE, Onoharigho FD. Menstrual waste management practices among female students in Niger Delta Development Commission hostels in educational institutions in Niger Delta, Nigeria. *BMC Womens Health*. 2025;25(1):60. <https://doi.org/10.1186/s12905-025-03549-x>
14. Nwoye C. An investigation into WASH-related aspects of unhygienic menstrual practices among female students in colleges of education in Anambra State. *Indones J Educ Soc Humanit*. 2024;1(4):11–24.
15. Phillips-Howard PA, Caruso B, Torondel B, Zulaika G, Sahin M, Sommer M. Menstrual hygiene management among adolescent schoolgirls in low- and middle-income countries: research priorities. *Glob Health Action*. 2016;9(1):33032. <https://doi.org/10.3402/gha.v9.33032>
16. Sommer M, Caruso BA, Torondel B, Warren EC, Yamakoshi B, Haver J, et al. Menstrual hygiene management in schools: midway progress update on the "MHM in Ten" 2014–2024 global agenda. *Health Res Policy Syst*. 2021;19(1):1. <https://doi.org/10.1186/s12961-020-00669-8>

17. Kuhlmann AS, Henry K, Wall LL. Menstrual hygiene management in resource-poor countries. *Obstet Gynecol Surv.* 2017;72(6):356–376. <https://doi.org/10.1097/OGX.0000000000000443>
18. Betsu BD, Medhanyie AA, Gebrehiwet TG, Wall LL. Menstrual hygiene management interventions and their effects on schoolgirls' menstrual hygiene experiences in low and middle countries: a systematic review. *PLoS ONE.* 2024;19(8):e0302523. <https://doi.org/10.1371/journal.pone.0302523>
19. Odey GO, Shitta HK, Elom HA, Iheagwam FN, Elom MA, Odey JO, et al. Period during a pandemic: the neglected reality of Nigerian girls and women. *Public Health Pract.* 2021;2:100196. <https://doi.org/10.1016/j.puhip.2021.100196>
20. Kuponiyi SF, Amubode AA. Systematic narrative review on menstrual health and hygiene (MHH) in Nigeria, Ghana, Liberia and The Gambia. *Int Health.* 2026;18(3):381–394. <https://doi.org/10.1093/inthealth/ihag029>