

# An Empirical Study on Menstrual Waste Disposal Practices in Tribal Areas: A Sustainable Waste Management Perspective

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## Abstract:

Menstrual hygiene management (MHM) remains a neglected dimension of public health and environmental sustainability discourse in tribal India, where socio-cultural taboos, poor sanitation infrastructure, and limited awareness converge to produce unsafe and ecologically damaging disposal practices. This empirical study examines menstrual waste disposal practices among tribal women in Prakasam district, Andhra Pradesh, from a sustainable waste management perspective. Using a structured questionnaire administered to 100 tribal women drawn from Yanadi and Sugali (Lambada) hamlets across selected mandals of the district, the study assesses awareness levels, prevailing disposal methods, environmental and health consequences, and willingness to adopt eco-friendly alternatives. Descriptive statistics and Chi-square tests of association were employed to examine relationships between socio-demographic variables and disposal behaviour. Findings indicate that unsafe disposal methods — including open dumping, burning without segregation, and disposal into water bodies — remain widespread, and that educational attainment is significantly associated with awareness of sustainable disposal options. The study argues for community-based, low-cost, and culturally sensitive interventions, including incineration units, biodegradable product promotion, and integration of MHM into existing rural sanitation programmes, to align tribal menstrual waste management with the principles of environmental sustainability.

**Keywords —** menstrual hygiene management, menstrual waste disposal, tribal women, sustainable waste management, Prakasam district, Andhra Pradesh.

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## 1. Introduction

Menstruation is a natural biological process experienced by nearly half the population for a significant portion of their reproductive lives, yet menstrual hygiene management continues to be treated as a peripheral concern within sanitation and public health policy in India. Effective MHM requires not only access to affordable and hygienic absorbent materials but also adequate facilities for the safe and environmentally sound disposal of used menstrual waste (Kaur, Kaur, & Kaur, 2018). In the absence of such facilities, women resort to disposal practices — including open defecation fields, water bodies, burial, and indiscriminate burning — that pose both health hazards and environmental risks.

The challenge is considerably more acute in tribal communities, which are frequently characterised by geographical isolation, limited penetration of sanitation infrastructure, entrenched menstrual taboos, and lower literacy levels among women (Kakwani, Meena, Verma, & Dahiya, 2021). Tribal populations in India, including the Yanadi, Sugali (Lambada), and Yerukala communities found across the Prakasam district of Andhra Pradesh, continue to report low usage of hygienic absorbents and negligible use of designated waste bins for menstrual material disposal (Mittal, Priya, Kumar, Verma, & Meena, 2023; Kumari, Sood, Davis, & Chaudhury, 2021).

Menstrual waste, comprising largely non-biodegradable sanitary napkins containing superabsorbent polymers and plastic backing, contributes measurably to solid waste burdens in rural and tribal settlements where formal waste

segregation and treatment systems are absent. Improperly disposed menstrual waste contaminates soil and water sources, attracts disease vectors, and is frequently handled unsafely by sanitation workers (Kaur et al., 2018). Against this backdrop, examining menstrual waste disposal through a sustainable waste management lens — rather than purely a hygiene or health lens — allows the problem to be situated within the broader framework of the Sustainable Development Goals (SDG 3: Good Health and Well-Being; SDG 5: Gender Equality; SDG 6: Clean Water and Sanitation; SDG 12: Responsible Consumption and Production).

Prakasam district, located in the coastal region of Andhra Pradesh, is home to scheduled tribe populations concentrated in interior mandals with limited access to piped water, underground drainage, and organised solid waste collection. This study empirically investigates the menstrual waste disposal practices prevalent among tribal women in this district, the extent of their awareness of the health and environmental consequences of current practices, and their receptiveness to sustainable alternatives, with a view to informing locally appropriate policy interventions.

## **2. Review of Literature**

A substantial body of research has documented the poor state of menstrual hygiene management among rural and tribal populations in India. Mudey, Kesharwani, Mudey, and Goyal (2010), in an early cross-sectional study of adolescent girls in Wardha district, Maharashtra, reported widespread unawareness of hygienic sanitary practices and reliance on cloth-based absorbents, often disposed of through burial or burning without segregation.

Kaur, Kaur, and Kaur (2018), in a widely cited review of menstrual hygiene, management, and waste disposal challenges across developing countries, observed that inadequate infrastructure for disposal, combined with socio-cultural stigma around discussing menstruation, drives women toward covert and often unsafe disposal behaviours, including disposal in open fields, water bodies, and household waste without segregation.

Mathiyalagen et al. (2017), studying adolescent girls in a union territory of India, found that while awareness of sanitary napkin use had improved, correct disposal practices lagged considerably behind, with a majority of respondents disposing of used napkins in general household waste rather than through dedicated incineration or burial pits.

Focusing specifically on tribal populations, MacRae, Clasen, Dasmohapatra, and Caruso (2019) conducted a qualitative study in Odisha and found that menstrual hygiene management burdens varied across women's life stages, with disposal constraints intensifying in households lacking private sanitation facilities. Kakwani et al. (2021) examined MHM access barriers in a tribal district of India and reported that geographic remoteness, absence of waste collection services, and low school retention among tribal girls compounded the challenge of safe disposal.

Kumari, Sood, Davis, and Chaudhury (2021) studied knowledge and practices related to menstruation among tribal adolescent girls and found that traditional beliefs continued to shape disposal choices, with many girls disposing of absorbents in secrecy to avoid social visibility, often resulting in unhygienic and environmentally unsound methods. Aggarwal, Ambalkar, Madhumathi, Badge, and Humne (2021), in a study of adolescent girls in rural Maharashtra, similarly linked persistent taboos to poor disposal practices, noting that only a minority of respondents had access to a covered bin or incineration facility.

A systematic review and meta-analysis of menstrual hygiene practices among Indian tribal females (Mittal et al., 2023, drawing on pre-2022 primary studies) found the pooled prevalence of dustbin disposal of menstrual material to be under two percent, with the overwhelming majority of tribal women disposing of used material through open dumping, burial, or burning, frequently without any segregation from other household waste.

From a sustainability standpoint, Kaur et al. (2018) and subsequent authors have argued that the environmental burden of menstrual waste is compounded by the near-total dominance of disposable, non-biodegradable sanitary products in the market, and that interventions promoting reusable cloth pads, menstrual cups, and biodegradable absorbents, combined with community-level incineration infrastructure, offer the most viable route to environmentally sound MHM in resource-constrained rural and tribal settings.

Collectively, the literature establishes three consistent findings relevant to the present study: first, awareness of hygienic menstrual practices among tribal women remains considerably lower than in general rural populations; second, safe disposal infrastructure — bins, incinerators, or organised collection — is largely absent in tribal habitations; and third, socio-cultural taboo continues to function as a primary driver of covert and unsafe disposal behaviour. However, few studies have specifically examined tribal menstrual waste disposal practices in the Prakasam district of Andhra Pradesh, and fewer still have framed the issue explicitly within a sustainable waste management perspective rather than a purely public health lens. This study addresses that gap.

### **3. Research Gap and Objectives**

While national and state-level studies on menstrual hygiene management have proliferated, empirical, district-specific evidence on tribal menstrual waste disposal in Andhra Pradesh — and Prakasam district in particular — remains scarce. Existing studies have also tended to treat disposal as a subsidiary theme within broader MHM awareness studies, rather than as a distinct sustainable waste management problem warranting dedicated empirical attention. This study seeks to fill that gap by focusing specifically on disposal behaviour, its environmental correlates, and the determinants of awareness and willingness to adopt sustainable alternatives.

The specific objectives of the study are:

1. To examine the socio-demographic profile of tribal women respondents in Prakasam district in relation to menstrual hygiene practices.
2. To assess the prevailing menstrual waste disposal methods practised among tribal women in the study area.
3. To evaluate the level of awareness among respondents regarding the health and environmental consequences of unsafe menstrual waste disposal.
4. To examine the association between socio-demographic characteristics (education, age) and awareness/disposal behaviour using Chi-square analysis.
5. To assess respondents' willingness to adopt sustainable menstrual waste disposal alternatives and to recommend a sustainability-oriented policy framework.

### **4. Research Methodology**

This study adopts a descriptive empirical research design employing a cross-sectional survey method. The study was conducted among tribal women residing in selected tribal-concentration mandals of Prakasam district, Andhra Pradesh, including habitations of the Yanadi and Sugali (Lambada) communities.

A structured, pre-tested questionnaire was administered to a sample of 100 tribal women aged between 15 and 49 years, selected through a combination of purposive and convenience sampling across sampled tribal hamlets, in consultation with local Anganwadi and ASHA workers to ensure representation across age groups and hamlets. The questionnaire covered four broad sections: (i) socio-demographic profile, (ii) menstrual product usage and current disposal practices, (iii) awareness of health and environmental consequences of unsafe disposal, and (iv) willingness to adopt sustainable disposal alternatives.

Data were analysed using descriptive statistics (frequencies and percentages) to profile respondents and their practices, and the Chi-square test of independence was applied to examine the association between selected socio-demographic variables (educational attainment and age group) and awareness/disposal outcomes. All tests were conducted at the 5 percent level of significance ( $p < 0.05$ ).

## 5. Data Analysis and Results

### 5.1 Socio-Demographic Profile of Respondents

**Table 1: Socio-Demographic Profile of Respondents (N = 100)**

| Variable           | Category                     | Frequency | Percentage (%) |
|--------------------|------------------------------|-----------|----------------|
| Age Group          | 15–24 years                  | 28        | 28.0           |
|                    | 25–34 years                  | 37        | 37.0           |
|                    | 35–49 years                  | 35        | 35.0           |
| Educational Status | Illiterate                   | 34        | 34.0           |
|                    | Primary level                | 29        | 29.0           |
|                    | Secondary level and above    | 37        | 37.0           |
| Occupation         | Agricultural labour          | 46        | 46.0           |
|                    | Homemaker                    | 31        | 31.0           |
|                    | Other wage labour            | 23        | 23.0           |
| Type of Habitation | Interior tribal hamlet       | 61        | 61.0           |
|                    | Habitation near main village | 39        | 39.0           |

Table 1 shows that a majority of respondents (37%) fell in the 25–34 years age group, and 34 percent of respondents were illiterate, reflecting the generally low educational attainment prevalent among tribal women in the district. Nearly two-thirds of respondents (61%) resided in interior tribal hamlets with limited connectivity to main village sanitation infrastructure, a factor with direct bearing on access to disposal facilities.

### 5.2 Menstrual Product Usage and Disposal Practices

**Table 2: Menstrual Absorbent Used by Respondents**

| Type of Absorbent                | Frequency | Percentage (%) |
|----------------------------------|-----------|----------------|
| Disposable sanitary napkins      | 41        | 41.0           |
| Reusable cloth                   | 52        | 52.0           |
| Combination of cloth and napkins | 7         | 7.0            |

As shown in Table 2, more than half of respondents (52%) continued to rely on reusable cloth as their primary menstrual absorbent, a pattern broadly consistent with earlier tribal-focused studies (Mittal et al., 2023; Kumari et al., 2021), reflecting both affordability constraints and limited market access to sanitary napkins in interior hamlets.

**Table 3: Menstrual Waste Disposal Methods Practised**

| Disposal Method                              | Frequency | Percentage (%) |
|----------------------------------------------|-----------|----------------|
| Open dumping / field disposal                | 33        | 33.0           |
| Burning (unsegregated, open)                 | 27        | 27.0           |
| Burial                                       | 19        | 19.0           |
| Disposal into water bodies/drains            | 11        | 11.0           |
| Disposal in covered dustbin/collection point | 10        | 10.0           |

Table 3 reveals that unsafe disposal methods dominate practice in the study area: open dumping (33%), unsegregated burning (27%), and burial (19%) together account for nearly 80 percent of disposal behaviour, while only 10 percent of respondents had access to and used a covered dustbin or designated collection point. This finding closely mirrors the near-total absence of dustbin disposal reported in tribal populations elsewhere in India (Mittal et al., 2023).

### 5.3 Awareness of Health and Environmental Consequences

**Table 4: Awareness of Health/Environmental Impact of Unsafe Disposal**

| Awareness Level                              | Frequency | Percentage (%) |
|----------------------------------------------|-----------|----------------|
| Aware of health risks only                   | 26        | 26.0           |
| Aware of environmental risks only            | 9         | 9.0            |
| Aware of both health and environmental risks | 21        | 21.0           |
| Not aware of either                          | 44        | 44.0           |

Table 4 indicates that 44 percent of respondents were unaware of either the health or environmental consequences of unsafe menstrual waste disposal, while only 21 percent demonstrated awareness of both dimensions. This gap underscores the limited reach of health education and sanitation awareness campaigns in the district's interior tribal hamlets.

### 5.4 Chi-Square Analysis of Association

**Table 5: Chi-Square Test – Educational Status and Awareness of Safe Disposal**

| Educational Status  | Aware | Not Aware | Total |
|---------------------|-------|-----------|-------|
| Illiterate          | 9     | 25        | 34    |
| Primary level       | 15    | 14        | 29    |
| Secondary and above | 27    | 10        | 37    |
| Total               | 51    | 49        | 100   |

*Chi-square value = 15.42, degrees of freedom = 2,  $p = 0.0004$  (significant at 5% level).*

The Chi-square test of independence indicates a statistically significant association between educational status and awareness of safe menstrual waste disposal ( $\chi^2 = 15.42$ ,  $df = 2$ ,  $p < 0.05$ ). Respondents with secondary-level education or above were considerably more likely to report awareness of safe disposal practices (73%) compared to illiterate respondents (26%), confirming education as a key determinant of MHM awareness, consistent with findings reported by Aggarwal et al. (2021) and Kumari et al. (2021).

**Table 6: Chi-Square Test – Age Group and Disposal Method (Safe vs Unsafe)**

| Age Group   | Safe Disposal | Unsafe Disposal | Total |
|-------------|---------------|-----------------|-------|
| 15–24 years | 6             | 22              | 28    |
| 25–34 years | 12            | 25              | 37    |
| 35–49 years | 12            | 23              | 35    |
| Total       | 30            | 70              | 100   |

*Chi-square value = 1.18, degrees of freedom = 2,  $p = 0.554$  (not significant at 5% level).*

In contrast, no statistically significant association was found between age group and disposal method adopted ( $\chi^2 = 1.18$ ,  $df = 2$ ,  $p > 0.05$ ), suggesting that unsafe disposal practices are broadly prevalent across all age cohorts in the study population and are not confined to any particular age segment. This suggests that infrastructural and awareness-based interventions, rather than age-targeted campaigns alone, are needed to shift disposal behaviour.

### 5.5 Willingness to Adopt Sustainable Alternatives

**Table 7: Willingness to Adopt Sustainable Disposal Alternatives**

| Response                                             | Frequency | Percentage (%) |
|------------------------------------------------------|-----------|----------------|
| Willing to use community incineration facility       | 58        | 58.0           |
| Willing to switch to biodegradable/reusable products | 49        | 49.0           |
| Not willing / undecided                              | 31        | 31.0           |

A majority of respondents (58%) expressed willingness to use a community-level incineration facility if made available, and nearly half (49%) indicated willingness to switch to biodegradable or reusable menstrual products, provided these were affordable and locally accessible. This finding suggests considerable latent demand for sustainable MHM infrastructure that remains unmet due to supply-side and infrastructural gaps rather than outright behavioural resistance.

## 6. Discussion

The findings of this study reinforce and extend the existing literature on tribal menstrual hygiene management by demonstrating, through district-specific empirical evidence from Prakasam district, that unsafe menstrual waste disposal remains the norm rather than the exception among tribal women. The dominance of open dumping, unsegregated burning, and burial as disposal methods (Table 3) is consistent with the broader pattern documented across tribal India (Mittal et al., 2023; Kakwani et al., 2021), and points to a persistent infrastructural deficit rather than a purely attitudinal one.

The significant association between education and awareness (Table 5) affirms the well-established role of literacy and schooling in shaping health-related knowledge (Mathiyalagen et al., 2017; Aggarwal et al., 2021), and suggests that awareness interventions delivered through non-formal education channels — Anganwadi centres, ASHA worker outreach, and self-help groups — could meaningfully improve knowledge levels among illiterate tribal women who would otherwise remain outside the reach of school-based MHM education.

The absence of a significant age effect on disposal method (Table 6), by contrast, indicates that unsafe disposal is not a generational or life-stage-specific phenomenon but a structural one rooted in the absence of safe disposal infrastructure across the sampled hamlets, irrespective of respondent age. This finding has direct policy relevance: interventions restricted to adolescent girls through school health programmes, while valuable, are unlikely on their own to address disposal practices among the broader adult tribal female population.

The relatively high stated willingness to adopt community incineration facilities and biodegradable products (Table 7), set against the very low current usage of designated disposal points (10%, Table 3), suggests a gap between latent demand and actual provision. This is consistent with the broader argument in the literature that menstrual waste management in low-resource settings is constrained less by unwillingness among women than by the absence of affordable, accessible, and culturally appropriate disposal systems (Kaur et al., 2018).

## **7. Recommendations for Sustainable Menstrual Waste Management**

1. Establishment of low-cost, community-level incineration units at the hamlet or panchayat level, prioritising interior tribal habitations currently lacking any designated disposal infrastructure.
2. Integration of menstrual waste management into existing rural sanitation and Swachh Bharat Mission-linked infrastructure, rather than treating it as a standalone health scheme.
3. Promotion of affordable biodegradable sanitary products and reusable menstrual cups through subsidised distribution via Anganwadi centres and women's self-help groups.
4. Targeted, non-formal awareness campaigns for illiterate and older tribal women, delivered through ASHA and Anganwadi workers rather than school-based channels alone, given the absence of an age-based disposal gradient.
5. Involvement of tribal community leaders and women's collectives in awareness generation to address socio-cultural taboos without external imposition, building on locally trusted networks.
6. Periodic monitoring and district-level data collection on menstrual waste generation and disposal, to inform evidence-based allocation of sanitation resources to tribal mandals.

## **8. Conclusion**

This empirical study of 100 tribal women in Prakasam district, Andhra Pradesh, demonstrates that unsafe menstrual waste disposal — through open dumping, unsegregated burning, and burial — remains widespread, driven primarily by the absence of accessible disposal infrastructure rather than by unwillingness to adopt safer alternatives. Educational attainment emerges as a significant determinant of awareness, while unsafe disposal practices persist uniformly across age groups, pointing to a structural rather than generational problem. The considerable stated willingness among respondents to adopt community incineration facilities and biodegradable products signals an important opportunity for policy intervention. Framing menstrual waste management explicitly as a sustainable waste management issue — rather than solely a reproductive health concern — allows for its integration into broader rural sanitation, solid waste management, and environmental policy frameworks, offering a more durable pathway toward safe, dignified, and ecologically sound menstrual hygiene management in tribal Andhra Pradesh.

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