

Perspectives on Sustainable Sanitary Waste Disposal: Exploring Attitudes and Adoption of Eco-Friendly Methods

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Introduction

Menstruation, or the menstrual period, is a natural biological process in which the uterine lining is shed, leading to bleeding. To develop effective menstrual hygiene systems, we must understand local perceptions and attitudes toward menstruation. The growing volume of menstrual waste means that ineffective and unsustainable waste management practices must be dismantled [1]. Most unsanitary practices and the lack of adequate disposal infrastructure highlight a critical need for greater awareness and improved practices [2]. India's rapidly growing population and the rise in disposable menstrual products are both challenging. The increasing rate of non-biodegradability in menstrual waste is a significant concern, but treating bin disposal as if it were a blow is also dangerous [3]. While public health risks are minimal, the environmental impact of flushed sanitary items, particularly aesthetic pollution, is substantial, driving

efforts to encourage more sustainable disposal methods through public awareness campaigns[4]. Changes in cycle length, regularity, and bleeding patterns directly affect women's needs and choices regarding menstrual product use, often leading to increased or unpredictable demand [5]. Period product insecurity frequently results in considerable psychological distress, underscoring its substantial emotional impact[6]. High profit margins and limited tax relief drive up menstrual product prices, compounding challenges for consumers and worsening period poverty [7].

Significance of the Study

The lack of improved waste management methods based on advanced technologies poses an environmental challenge in the elimination of sanitary disposal. Menstrual waste is abundant and increasing primarily because traditional sanitary pads contain plastic and synthetic materials that biodegrade slowly, posing a significant environmental threat. Focusing solely on sustainable menstrual hygiene without addressing waste-disposal practices can inadvertently increase waste. Therefore, this study aims to gain insights into the challenges and opportunities that arise during the transition to sustainable sanitary waste practices. Making waste management systems effective and thereby reducing environmental impact is only possible by closely examining the factors that influence people's knowledge, practices, and preferences, and by restructuring accordingly. The study examines women's use of sustainable menstrual products and the shortcomings of the infrastructure. It is also intended to highlight the challenges faced in menstrual waste disposal. This study will help understand the environmental pollution caused by mismanaged sanitary waste disposal, identify sustainable waste management methods, and improve waste management practices to a high standard.

Statement of the problem

Environmental challenges from menstrual waste stem from poor disposal practices, chemical exposure from products, and resistance to sustainable alternatives. Improper waste disposal can affect both public health and the environment. The growing concern in India is the generation of sanitary pad waste, which amounts to 13,000 tonnes annually[8]. The situation in rural areas is complex; unsafe menstrual waste disposal practices and a lack of awareness put health and sanitation at risk. Limited access to menstrual products and price disparities are leading to significant health and social challenges in these regions [9]. Nearly 48% of women in India are unaware of the proper use and disposal of

menstrual products, making it harder to maintain hygiene and dignity during menstruation[10]. Inadequate policies and awareness programs, coupled with lax government approaches, have led to an increase in the rate of menstrual waste. Many efforts are being made to overcome such situations, but none have been successful so far, and this affects both women's health and education. Several economic and cultural factors limit the use of sustainable menstrual products. Many women are hesitant to use sustainable menstrual products like the menstrual cup due to unclear instructions and cultural taboos. Many women are hesitant to use sustainable menstrual products like the menstrual cup due to unclear instructions and cultural taboos [11].

Field of Study

This study was conducted at Cochin University of Science and Technology (CUSAT), a leading public university established in 1971 in Kochi, Kerala. The university includes campuses, research centres, and departments spread across about 600 acres, serving a diverse group of students, scholars, teaching faculty, and non-teaching staff. The community comprises undergraduate and postgraduate students, research scholars, government employees, and contractual or self-employed workers in support services. This institutional setting is a microcosm for studying sanitary waste management, as it brings together people from varied educational and employment backgrounds and socio-economic strata, all using shared infrastructure and sanitation facilities within a defined area.

Environmental impact of Menstrual products

Growing awareness of the environmental impact of menstrual products is driving demand for eco-friendly alternatives. Menstrual cups and reusable sanitary pads are widely used menstrual hygiene products among women. They are gaining more attention because they are not harmful to health, and have ecological benefits [12]. The natural decomposition time of the menstrual product in soil is very long, mainly because of the substances it contains and the way it decomposes [13]. The main environmental impact of menstrual products extends beyond microplastic pollution to include petroleum-based materials, manufacturing emissions, and waste management challenges [14]. While there has been increased policy attention on improving access, affordability, and availability of period products, there has been comparatively less focus on the environmental impact of single-use options, such as waste generation and resource consumption[15][16]. The harmful substances generated from recycling

sanitary products also pose a risk, as they can eventually enter the food chain, cause pollution and endanger natural habitats [17]. The environmental performance of reusable pads can depend heavily on user habits, such as washing and drying practices [18].

Current Sanitary Pad Disposal Practices

Sanitary waste is managed in accordance with the legal framework, formulated under the Solid Waste Management Rule 2016 and the Central Pollution Control Board guidelines 2018. Sanitary pad disposal practices vary significantly across regions, influenced by cultural, social, and environmental factors [19]. Inappropriate disposal methods, such as open burning and disposal in regular waste bins, are prevalent, leading to hazardous environmental pollution in many areas. Among civilised societies that fail to follow proper waste management practices, disposable sanitary pads remain the most widely used during menstruation [20]. Women's menstrual waste management is a failure in the current situation, especially in terms of safety, privacy, and a sterile environment for women [21]. Personal hygiene during menstruation and the methods to achieve it are higher among married women [22]. Women generally dispose of their menstrual waste and related items in household garbage; however, in urban environments, they use toilets to flush and deposit waste in public waste bins [23] [21]. Implementing a regulation requiring the collection of segregated menstrual waste for composting is the best way to ensure an effective sanitary waste management mechanism [24].

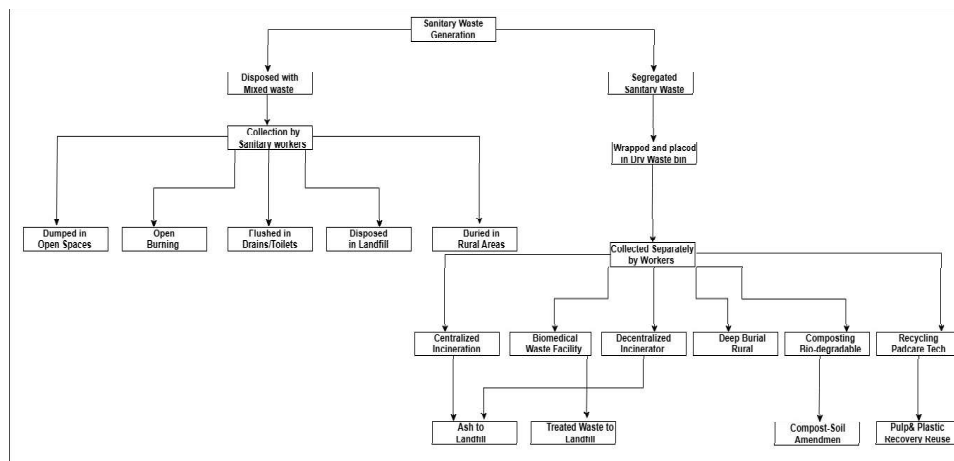


Figure 1

Source: Based on the CPCB guidelines and the Solid Waste Management Rule 2016.

Overview of Disposal Methods

Women face significant challenges due to the lack of menstrual hygiene facilities, which hinders waste management. Limited product options and cultural beliefs worsen the issue. The lack of appropriate infrastructure, privacy, and awareness exacerbates these issues, leading to unsanitary conditions and potential health hazards [25]. Lack of knowledge of disposal methods is the primary obstacle to effective menstrual waste management. The most common disposal practices are discarding waste in public dumpsters, flushing it down toilets, wrapping it in paper or plastic, and burying it [26]. It is vital to provide reusable menstrual products to reduce waste and to implement robust waste management practices for single-use products.

Challenges Faced by Consumers:

Consumers experience several challenges during their menstrual cycles. These include severe financial burdens from period poverty, cultural and social barriers that affect product choices, and significant physical and psychological distress. These challenges stem from deeply ingrained sociocultural taboos, a lack of agency shaped by patriarchal structures, and practical concerns about cost and personal comfort. Students struggle financially to manage menstrual health because of rising product costs, directly impacting their budgets and forcing difficult choices about hygiene[27]. Traditional sanitary napkins remain widely

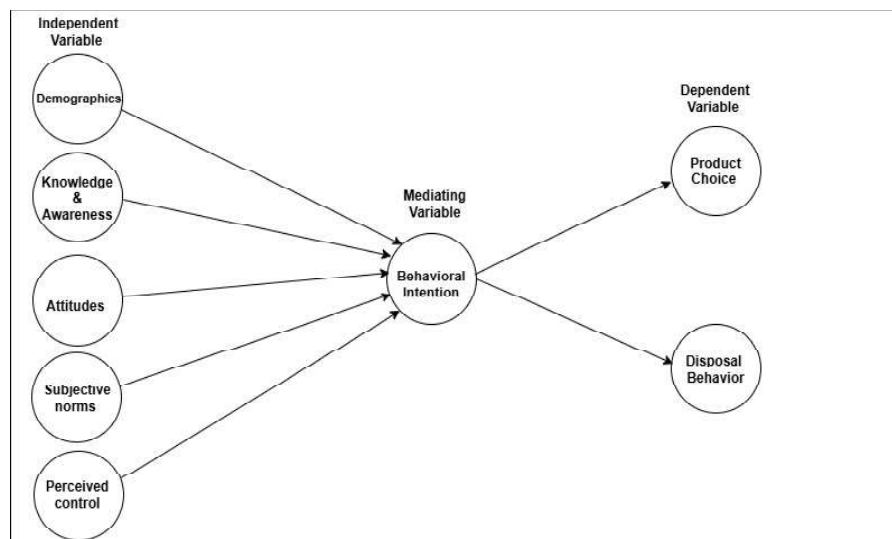


Figure 2: Conceptual framework

Source: Authors own

used by women because of familiarity, accessibility, and generational knowledge, despite frequently causing discomfort, including pain, rashes, itching, odor, and irritation[28]. This environment fosters feelings of shame, fear, anxiety, and depression associated with menstruation [29]. Consumers struggle to reconcile the natural, embodied experience of menstruation with marketing that frames it as shameful and in need of ‘protection.’ This leads women to both resist and accept these messages, simultaneously challenging and internalising them. Thus, the gender paradox lies in the coexistence of resistance to, and acceptance of, these contradictory consumer practices [30].

Objectives of the Study

1. To assess the pattern of menstrual product use among youngsters.
2. To identify traditional menstrual products and their alternative methods.
3. To analyse methods of disposal of menstrual products.
4. To identify different sanitary waste management methods and their impacts.

Research Questions

1. What are the most common substances women use during menstruation?
2. What are the environmental challenges faced if menstrual waste is not disposed of properly?
3. What methods are currently employed by women for the disposal of menstrual waste?
4. How do women view menstrual hygiene products in terms of usage, sustainability, and perception?
5. What are the challenges women face in adopting sustainable menstrual hygiene products?

Result & Discussion

Demographic Profile Analysis

The dataset has 200 respondents with diverse socio-demographic traits. Most are young, highly educated, and academically focused.

Table 1

<i>Marital status</i>	<i>Frequency</i>	<i>Percent</i>	<i>Valid Percent</i>	<i>Cumulative Percent</i>
Married	89	44.5	44.5	44.5
single	106	53.0	53.0	97.5

<i>Marital status</i>	<i>Frequency</i>	<i>Percent</i>	<i>Valid Percent</i>	<i>Cumulative Percent</i>
Divorced	4	2.0	2.0	99.5
Widow	1	.5	.5	100.0
Total	200	100.0	100.0	
Age				
15-25	65	32.5	32.5	32.5
26-35	79	39.5	39.5	72.0
36-45	46	23.0	23.0	95.0
46-55	10	5.0	5.0	100.0
Total	200	100.0	100.0	
Qualification				
Secondary	2	1.0	1.0	1.0
Higher secondary	10	5.0	5.0	6.0
Under graduate	58	29.0	29.0	35.0
Postgraduate and above	130	65.0	65.0	100.0
Occupation				
Unemployed	5	2.5	2.5	2.5
Self-employed	46	23.0	23.0	25.5
Student	90	45.0	45.0	70.5
Govt-employee	57	28.5	28.5	99.0
Pvt-sector	2	1.0	1.0	100.0
Total	200	100.0	100.0	
Monthly Income				
5-10	4	2.0	2.0	2.0
10-20	30	15.0	15.0	17.0
20-30	35	17.5	17.5	34.5
30-40	15	7.5	7.5	42.0
40 and above	47	23.5	23.5	65.5
Dependent	69	34.5	34.5	100.0
Total	200	100.0	100.0	

Source: Primary data

Marital Status Distribution

Regarding marital status, most respondents are **single** (53.0%, n=106), while 44.5% (n=89) are married. Divorced (2.0%, n=4) and widowed (0.5%, n=1) individuals comprise small groups. This pattern aligns with the sample's age profile and underscores the prevalence of younger, unmarried participants, a theme echoed across other demographic groups.

Age Composition

The sample is youthful: 72.0% are aged 15-35. The largest group is 26-35 years (39.5%, n=79), followed by 15-25 years (32.5%, n=65). Middle-aged respondents (36-45 years) make up 23.0% (n=46), and only 5.0% (n=10) are in the 46-55 age bracket. This shows the sample centers on young adults and early professionals.

Educational Qualifications

The sample has high educational attainment: 65.0% (n=130) hold postgraduate degrees or higher, and 29.0% (n=58) are undergraduates. Overall, 94.0% have graduate-level education or above; 6.0% have secondary (1.0%, n=2) or higher secondary (5.0%, n=10) qualifications. This concentration suggests an academic, professional, or urban environment.

Occupational Profile

Students are the largest occupational group (45.0%, n=90), matching the youth and advanced education found. Employed respondents include government employees (28.5%, n=57) and self-employed (23.0%, n=46). Private sector employees (1.0%, n=2) and unemployed (2.5%, n=5) make up small proportions. Employed, non-student respondents total 52.5%.

Monthly Income Distribution

Income patterns are varied. Of income earners (65.5% of the sample), the largest group is the 40,000+ **category** (23.5%, n=47), showing many high-income respondents. The 20-30 thousand bracket is 17.5% (n=35); the 10-20 thousand bracket is 15.0% (n=30). Financially dependent respondents are 34.5% (n=69), aligning with the student group. Lower incomes (5-10 thousand: 2.0%; 30-40 thousand: 7.5%) are smaller.

Sample Characteristics and Implications

This demographic profile shows a sample that is young, well-educated, and academically active. The high numbers of single people, students, and 15-35-year-olds suggest data from a university or academic setting. The many government employees and high earners point to working professionals, perhaps faculty or researchers.

The overlap between student status (45.0%) and financial dependence (34.5%) is expected, but the 11-point gap means some students have income. The split between financial dependence and high income reflects a sample of both students and professionals.

Disposal practice of the menstrual products

A cross tabulation of education qualification and usual method of disposing used menstrual products showed that burning was the most frequently reported method across all education groups, followed by “other” informal methods, with composting rarely reported. There was **no statistically significant**

Table 2

		<i>Education qualification</i>				<i>Total</i>
		<i>Secondary</i>	<i>Higher secondary</i>	<i>Under graduate</i>	<i>Post-graduate and above</i>	
How do you	Dump in general waste	1	1	9	19	30
usually dispose	Flush down in the toilet	0	2	7	14	23
the used	Burn	1	7	21	66	95
menstrual	Compost	0	0	3	1	4
products?	Other	0	0	18	30	48
Total		2	10	58	130	200

Source: Primary data

association between education level and disposal method (Pearson $\chi^2(12) = 13.94$, $p = 0.304$), indicating that disposal practices were broadly similar irrespective of educational attainment.

Product choice

Table 3

		<i>Frequency</i>	<i>Percent</i>	<i>Valid Percent</i>	<i>Cumulative Percent</i>
Valid	Pad	149	74.5	74.5	74.5
	Menstrual cup	48	24.0	24.0	98.5
	Tampons	1	.5	.5	99.0
	Period Underwear	2	1.0	1.0	100.0
	Total	200	100.0	100.0	

Source: Primary data

It can be seen from the descriptive analysis of the data in that there is a high level of preference for the traditional method of disposal by the people who were surveyed. Sanitary pads were the most common and were used by almost three-quarters (74.5%, $n = 149$) of the respondents. Of particular interest is the

Table 4: Method of menstrual product disposal behaviour

		<i>Frequency</i>	<i>Percent</i>	<i>Valid Percent</i>	<i>Cumulative Percent</i>
Valid	Dump in the general waste	30	15.0	15.0	15.0
	Flush down in the toilet	23	11.5	11.5	26.5
	Burn	95	47.5	47.5	74.0
	Compost	4	2.0	2.0	76.0
	Other	48	24.0	24.0	100.0
	Total	200	100.0	100.0	

Source: Primary data

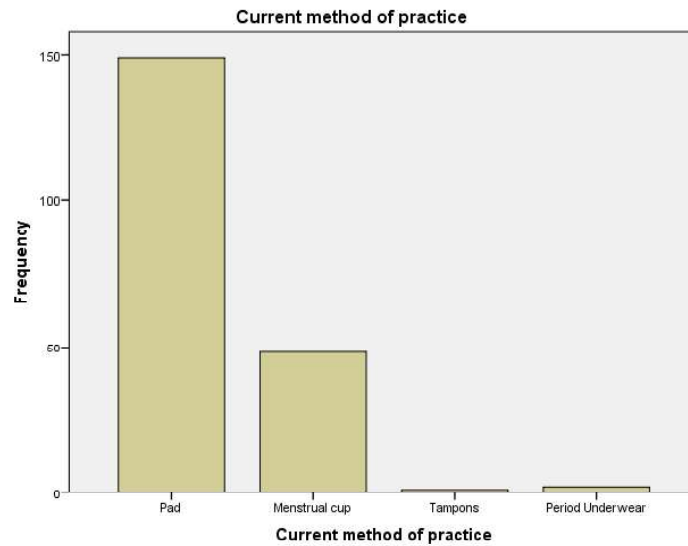


Figure 3

use of sustainable and reusable options, as almost a quarter of the sample (24.0%, $n = 48$) reported using a menstrual cup. Other modern or alternative methods are less well represented: only 1.0% ($n=2$) wear period underwear while only 0.5% ($n=1$) wear tampons.

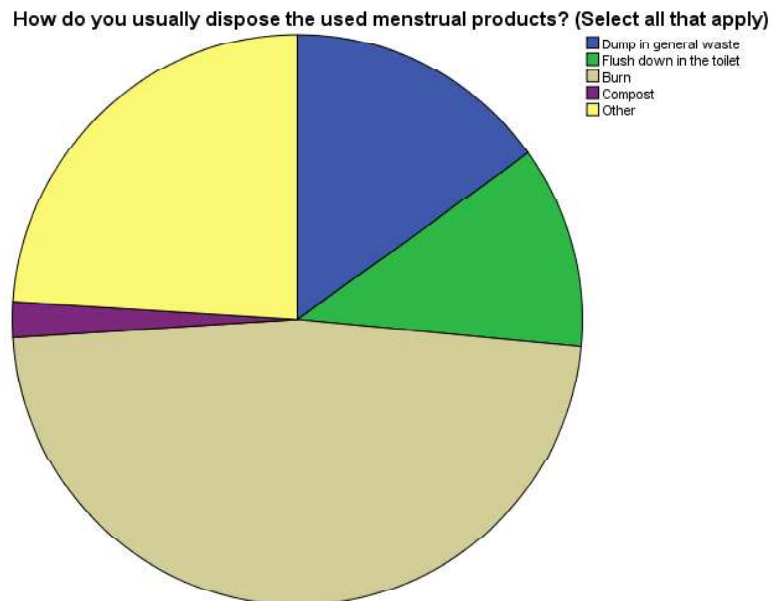


Figure 4

Primary data reveals that there is a lot of fragmentation in the menstrual waste management practices of the respondents. The main disposal method is open or localised burning, used by almost half of the cohort (47.5% n=95). The second largest category is “Other” methods (24.0% n=48) of the distribution. (15.0% n=23) of the sample used standard municipal disposal for waste, which is dumping in general waste. Important, a specific number of the respondents (11.5%, n=23) flush menstrual products down the toilet. Few alternatives to environmentally harmful substances are represented, only (2.0% n=4) of the population surveyed uses these.

Discussion

The outcomes of this study show that menstrual sanitary waste is not being handled properly in the main part of the surveyed young women (N = 200) and the practices, which they follow to manage the sanitary waste, are informal and unsafe. Almost half told us they would burn used menstrual products (47.5%), while a quarter (25.0%) would dump them in general household waste, 11.5% would flush them in the toilet and a very small minority would compost (2.0%). Another 24.0% chose the “other” options, a very varied category that may refer to burying, open dumping or other practice types that have been predefined that are not picked up by these options. It broadly mirrors the trends in the emerging evidence from India and other LMIC settings where open burning, disposal with mixed solid waste, and flushing of the pads are still common coping strategies to lack of adequate infrastructure and deep-seated taboos surrounding menstrual waste.

Burning is especially significant, both environment and public health. The act of burning disposable and other synthetic pads in residential or open burn sites can result in toxic emissions and add to air pollution in the area and dumping in mixed waste can pass the environmental and health risk to the municipal workers and landfill. The relatively limited use of composting and formal collection indicates that for many respondents safer and more sustainable ways to dispose of the waste are not available, accessible or realistic. This is significant in terms of the lack of menstrual waste management services and menstrual hygiene user support as more than 70% of respondents reported that they do not use any service that is clearly “safer” or formal means of menstrual waste management.

That is, women who are more concerned with the environment are slightly more likely to report more “relatively safe” or less obviously “dirty” practices, but many are not, and some women who are less concerned with the environment are still managing to adopt “safer” practices. Beyond individual awareness, there

is a critical need to address structural and contextual barriers like the absence of segregated collection sites, inadequate information about proper disposal locations in schools and communities, and restricted access to information on safe disposal paths.

Another finding, which has both implications, is that there is no single level behaviour change message to change menstrual waste management. The large 'other' category and the prevalence of burning and mixed waste disposal indicate a world where women come up with their own solutions for disposing of waste in very limited environmental and social conditions. Previous qualitative studies in similar settings have indicated that fear of stigma, privacy concerns and anxiety regarding menstrual blood being viewed or touched by other people have a significant impact on disposal decisions and can even influence women to avoid disposing of the blood when their intent is to dispose of it in an environmentally friendly way. Interventions, however, need to be cognizant of the gendered norms, privacy concerns and environmental goals, for instance, discreet and gender sensitive collection systems and provision of information regarding the interaction of sustainable menstrual products (such as menstrual cups or reusable pads) with waste management systems.

Policy-wise, the findings support the arguments to include menstruation waste in the overall solid waste planning instead of ignoring it as a household issue. This over-reliance of burning and mixed waste disposal by young women indicate that the current infrastructure and educational programs are not well designed to support the safe disposal of menstrual waste on the household/community levels. Some possible practical solutions are the provision of school and public facilities clearly labelled for menstrual waste disposal, the development of suitable small scale treatment solutions where formal collection service is limited and explicit segregation and awareness to be promoted of menstrual waste in the municipal waste segregation campaigns. Further, integrating menstrual hygiene initiatives with EE messages about the health hazards to waste workers and the longer term ecological effects of plastic-based products could enable to turn the existing environmental concerns into more sustainable waste disposal practices if infrastructure permits.

Many women have difficulties to ensure their economic security with respect to adopting an ecological approach. Sustainable menstrual products are a little more expensive than other products, and this can make it more difficult for women to afford them. In order to encourage sustainability, the health department and non-governmental organisations (NGOs) have initiated mass awareness campaigns to educate women about sustainable alternative for menstrual use.

These include campaigns and the provision of free menstrual cups as an alternative to disposables, which are reusable and cost effective. The biggest benefit of using a menstrual cup is that they are reusable and require cleaning after use. The number of menstrual cup users, however, is still relatively low compared to other users, suggesting that there is a need to raise awareness and education to promote sustainable use.

Concurrently, some cautions need to be noted when interpreting these findings. Firstly, the data are self-reported and recall bias and social desirability may affect this, especially for sensitive disposal practices, such as flushing or open dumping. Secondly, as the environmental perception scale was multi category, and the number of cells with low frequencies was high, particularly for composting, the chi square test may not have been robust. Third, the cross sectional study does not permit any conclusions concerning whether it is the environmental concern that influences safe disposal or vice versa (whether safe disposal changes perceptions over time). Finally, the study was carried out among a distinct group of young women, and the specific combination of disposal options and infrastructure may restrict the generalisability of the study's findings to other areas and groups of women.

Conclusion

The results of sanitary waste management in the study indicate that young women engage mainly in open burning and disposal of sanitary waste with mixed domestic waste which are the least effective methods of waste management followed by the very little use of sanitary waste management by using a formal system or environment-friendly waste management practices. While environmental perceptions are highly correlated with disposal behaviour, the finding of unsafe disposal practices even in the highest environmental concern levels suggests that awareness is not enough to ensure sustainable menstrual waste management if there is lack of supportive infrastructure, guidance and stigma sensitive solutions. Rather than focusing solely on the way menstrual waste can be addressed through individual behaviour change among women and girls, integrated approach is needed to improve access to safe disposal routes, targeted environmental and health education as well as policy level recognition of menstrual waste as a separate part of solid waste systems.

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