EuroMid Journal of Business and Tech-Innovation (EJBTI)
https://ejbti.com

Online ISSN: 3062-2131
Print ISSN: xxxx-xxxx

Eco-Friendly Feminine Hygiene: Unveiling Awareness and Practices in Sanitary Waste Management

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Received: June 2023; **Accepted**: January 2024

Abstract: Sustainable waste management for sanitary pads and diapers is crucial in the current scenario due to the environmental impact of non-biodegradable materials. Implementing eco-friendly practices not only addresses hygiene needs but also mitigates long-term ecological repercussions, promoting a more sustainable and environmentally conscious approach to feminine hygiene. This study investigates the awareness, misconceptions, and perceived effectiveness of past initiatives in eco-friendly sanitary waste recycling among a diverse group of women. Employing a mixed-methods approach, a stratified sampling strategy ensures representation across age groups and geographic areas. The study utilizes a structured questionnaire to collect quantitative data on demographic characteristics and participants' perspectives. Analysis includes descriptive statistics, an Analysis of Variance (ANOVA) for age and geographic differences, and a thematic analysis for qualitative insights. Despite a well-balanced demographic representation, ANOVA results reveal no statistically significant differences in awareness, misconceptions, or perceived effectiveness among age groups and geographic areas. Qualitative findings enrich the understanding, emphasizing the need for targeted interventions that consider specific contextual factors influencing women's attitudes toward eco-friendly sanitary waste practices. This study contributes to a nuanced comprehension of the factors influencing sustainable waste management practices among women.

Keywords: Eco-Friendly Practices, Sanitary Waste Recycling, Sustainable Waste Management, Environmental Impact, Feminine Hygiene.

Type: Research paper

DOI: 10.51325/ejbti.v3i1.196

1. Introduction

In the contemporary quest for sustainable living, the proper management and recycling of sanitary waste, including not only menstrual pads but also diapers, stands as an imperative pillar of eco-conscious initiatives (Baud et al., 2001). The project at hand endeavors to delve into the depths of awareness levels and understanding within our community regarding the eco-friendly recycling of these essential yet often environmentally challenging products. As we navigate the delicate intersection of hygiene, convenience, and environmental responsibility, it becomes pivotal to gauge the community's awareness, identify knowledge gaps, and evaluate the impact of past initiatives geared toward eco-friendly sanitary and diaper waste recycling. The following exploration aims to shed light on current

awareness levels, uncover prevailing misconceptions, and assess the efficacy of previous awareness programs. By extending our focus beyond menstrual pads to include diapers, we acknowledge the broader spectrum of waste generated in households, catering to the diverse needs of the community (Gibson, 2013).

This study is not merely an examination but a step toward fostering informed communities that are not only aware of the environmental implications of sanitary and diaper waste but are also equipped with the knowledge to actively contribute to sustainable waste management practices. Through collaborative efforts and insights gained from this investigation, we aspire to pave the way for renewed perspectives on waste, transforming it from a burden into an opportunity for environmental renewal (Colicchia, 2013).

1.1. Environmental Impact

The environmental impact of non-biodegradable sanitary pads and diapers lies in their contribution to landfill waste (Velasco Perez et al., 2021). These items, often containing plastics and synthetic materials, can take years to decompose, releasing harmful pollutants and exacerbating the burden on already strained waste management systems, highlighting the pressing need for sustainable alternatives and responsible disposal practices.

1.2. Eco-Friendly Sanitary and Diaper Waste Recycling

Eco-friendly sanitary and diaper waste recycling includes responsible and sustainable operations to recycle used products, reducing their harmful impact on the environment (Velasco Perez et al., 2021). The sustainable management system, combined with repurposing technology, handles previously used sanitary pads and diapers to reduce environmental degradation (Velasco Perez et al., 2021). Eco-friendly recycling initiatives focus on diverting these items from standard waste management systems while environmentally friendly processing techniques recycle the materials (Zhang et al., 2022). Eco-friendly sanitary and diaper waste recycling follows a structured protocol that entails the following sequence of steps. The first step involves organizing specific platforms for the collection of sanitary and diaper waste. Second, used sanitary pads and diapers must be separated from regular waste. The procurement of used waste begins with sorting processes that isolate all distinct components, such as plastics, absorbent materials, and other elements. Third, sanitization procedures should be implemented to ensure the proper cleaning of collected waste items. These procedures must meet hygiene requirements. Fourth, technologies should be employed to process the different materials recovered from sanitary and diaper waste for repurposing. Fifth, recycled materials should be transformed into new products or applications, such as eco-friendly packaging, construction materials, or other sustainable goods.

Statistics related to the environmental impact of disposable sanitary products and diapers highlight the urgency of adopting eco-friendly recycling practices. A woman may use approximately 5,000 to 15,000 disposable menstrual products in her lifetime (Hand et al., 2023). Traditional sanitary pads can take hundreds of years to decompose due to the plastics and synthetic materials used in their production (Mirzaie, 2021).

The average baby uses around 2,500 to 3,000 disposable diapers in their first year alone. Conventional disposable diapers can take centuries to decompose in landfills, significantly contributing to environmental pollution (Erasala, 2011).

Improper disposal of sanitary and diaper waste can lead to pollution of water bodies, soil contamination, and the release of harmful substances. The storage of non-biodegradable sanitary waste and diapers in landfills generates greenhouse gases and poses multiple environmental threats (Kimani, 2015).

Many countries are embracing sustainable waste management standards, fostering the creation of new eco-friendly recycling systems for sanitary and diaper waste (Erasala, 2011). Multiple countries and industries support initiatives for eco-friendly disposable waste products within broader single-use plastic reduction plans (Nielsen et al., 2020).

Adopting eco-friendly sanitary and diaper waste recycling solutions significantly reduces the environmental impact of single-use products, promoting the development of sustainable and environmentally conscious societies (Płotka-Wasylka et al., 2022; Shamsuddin et al., 2017). Statistical evidence demonstrates the urgency of implementing these methods to mitigate environmental risks from traditional sanitary and diaper waste disposal.

1.3. Chapter Flow of the Study

This study unfolds across several interconnected chapters, starting with an introduction that delineates the significance of sustainable waste management in the context of sanitary pads and diapers. The literature review scrutinizes existing research, providing a comprehensive understanding of the key factors influencing eco-friendly practices and the environmental impact of conventional waste disposal. Following this, the methodology chapter elucidates the study's design, sampling strategy, and data collection methods, emphasizing a mixed-methods approach to capture both quantitative and qualitative insights. Subsequently, the analysis chapter interprets the collected data using statistical tools such as ANOVA and qualitative thematic analysis. The final chapter draws upon these findings to formulate conclusions and implications for targeted interventions, encapsulating the study's contribution to fostering sustainable waste practices in feminine hygiene.

2. Literature Review

2.1. Review of Previous Studies

Eco-friendly sanitary waste recycling involves the adoption of sustainable practices for managing and repurposing used sanitary products in a manner that minimizes environmental impact (Duodu et al., 2022). The level of awareness among the general population regarding eco-friendly sanitary waste recycling is a critical aspect of promoting environmentally responsible practices (Basuki, 2015). This study explores key dimensions of this awareness, supported by relevant citations and references.

Environmental impact awareness is essential, as people must understand the damaging effects of standard sanitary waste disposal techniques on the environment. Standard sanitary items generate significant landfill waste that takes centuries to decompose due to their synthetic composition (Cho, 2018).

Knowledge of eco-friendly alternatives is fundamental to raising awareness. In contrast to regular disposable pads, traditional reusable sanitary items and biodegradable options significantly reduce environmental impact (Sommer et al., 2017).

Awareness of recycling initiatives is crucial for the success of such programs. Public knowledge about existing recycling initiatives influences participation rates. Various communication channels, including community programs and digital media, enhance engagement (Wilkinson, 2014).

Cultural sensitivity and taboos play a role in shaping awareness. Local beliefs and traditions influence perceptions of menstruation and sanitary waste, impacting the effectiveness of awareness campaigns. A comprehensive understanding of these cultural factors is necessary to develop culturally appropriate initiatives (Bobel & Fahs, 2019).

Demographic variations in awareness exist based on educational attainment, age, and economic status. These factors create disparities in knowledge and adoption of eco-friendly menstrual practices (Mason et al., 2013).

Biodegradability and decomposition of conventional sanitary products remain a central topic in academic discussions. Many individuals are unaware that synthetic materials in traditional sanitary pads significantly prolong their decomposition process (Cho, 2018). The lack of knowledge regarding natural product breakdown often leads to incorrect disposal decisions and misconceptions about the environmental impact of sanitary waste.

Reusable alternatives are not widely understood. Research conducted by Sommer et al. (2017) highlights the need for educational programs to inform individuals about reusable menstrual products such as cloth pads and menstrual cups. Many people hesitate to adopt eco-friendly alternatives due to misconceptions regarding hygiene and convenience.

Local recycling facilities for sanitary waste represent a significant knowledge gap. Wilkinson and Huisman (2014) found a widespread lack of awareness about the availability and functionality of these facilities. Misunderstandings arise from the assumption that even if waste is separated, recycling processes may not be effectively implemented.

Cultural stigmas and taboos continue to influence menstrual waste perception. Bobel and Fahs (2019) explain how cultural factors contribute to knowledge gaps by restricting open discussions about menstruation. This lack of dialogue fosters misconceptions that hinder the adoption of eco-friendly waste management practices.

Environmental impact misconceptions persist regarding the consequences of improper sanitary waste disposal. Mason et al. (2013) emphasize that public knowledge about the environmental effects of sanitary waste, including water contamination and greenhouse gas emissions, is limited. Many individuals mistakenly assume that sanitary waste has minimal environmental impact or decomposes easily.

Community recycling initiatives require increased awareness. Montgomery et al. (2016) highlight the importance of educating communities about local recycling initiatives for sanitary waste. Knowledge gaps often arise from limited information about such programs, leading to misconceptions about their feasibility and effectiveness.

2.2. Objectives and Hypotheses

The primary aims of this study are to measure the existing level of awareness within the target population regarding eco-friendly sanitary waste recycling, to identify specific areas of misconception or lack of knowledge related to eco-friendly sanitary waste recycling practices, and to assess the effectiveness of previous awareness initiatives or programs implemented in the community concerning eco-friendly sanitary waste recycling. The hypotheses derived are:

H1: There are significant differences in awareness levels among different demographic groups within the target population.

H2: There are geographic variations in the level of awareness about eco-friendly sanitary waste recycling within the study area.

H3: Past awareness initiatives or programs have significantly contributed to an increase in awareness levels regarding eco-friendly sanitary waste recycling.

3. Methodology

This study employed a mixed-methods approach to comprehensively examine women's awareness, misconceptions, and behavioral drivers concerning eco-friendly sanitary waste recycling. The integration of quantitative and qualitative methods allowed for a robust analysis of individual perceptions, contextual influences, and behavioral determinants.

3.1. Research Design

A convergent mixed-methods design was adopted, wherein quantitative and qualitative data were collected concurrently and analyzed separately before being integrated. The quantitative component focused on measuring awareness levels, misconceptions, and perceived effectiveness of past initiatives, while the qualitative component provided deeper insights into individual experiences and attitudes.

3.2. Sampling and Participants

The study used a stratified random sampling strategy to ensure a balanced representation across five age groups (under 18, 18–24, 25–34, 35–44, 45 and above) and four geographic areas (City, Town, Village, Interior Place). A total of 315 women participated, representing diverse socioeconomic and educational backgrounds.

3.3. Instrumentation

Data were collected through a structured questionnaire that included sections on demographic characteristics, awareness, and perception scales using 5-point Likert-type items, and open-ended questions for qualitative input. Content validity was ensured through expert review, and the internal consistency of the Likert-scale items was confirmed with a Cronbach's alpha of 0.84, indicating high reliability.

3.4. Data Collection

Participants were surveyed through a combination of online forms and paper-based questionnaires, enabling broad participation regardless of digital access. All participants provided informed consent and were assured of anonymity and the voluntary nature of their involvement.

3.5. Data Analysis

Quantitative data were analyzed using SPSS. Descriptive statistics were used to summarize demographic and awareness-related responses. One-way Analysis of Variance (ANOVA) was conducted to assess differences in awareness, misconceptions, and perceived effectiveness of initiatives across age groups and geographic locations. Before performing ANOVA and regression analyses, the data were tested for normality using the Shapiro–Wilk test and Q–Q plots. Assumptions of multicollinearity were checked using Variance Inflation Factors (VIF), all of which were below 5, indicating no significant multicollinearity.

To explore the factors influencing responsible sanitary waste disposal behavior, a multiple linear regression analysis was conducted. Independent variables included awareness, access to disposal facilities, education level, awareness of government or NGO programs, and availability of recycling services.

Qualitative data from open-ended responses were analyzed using Braun and Clarke's (2006) thematic analysis. An inductive coding approach was applied, leading to the development of themes reflecting barriers, motivations, cultural attitudes, and policy-related perceptions influencing sanitary waste management.

3.6. Ethical Considerations

Ethical clearance was obtained from the institutional review board of Kristu Jayanti College. Participants were fully informed about the purpose of the study, and participation was voluntary and confidential. Respondents had the option to withdraw at any stage of the research.

4. Results

4.1. Demographic Overview

In understanding the dynamics of eco-friendly sanitary waste recycling, a comprehensive exploration of the demographic profile of 315 women becomes pivotal. This demographic data encapsulates diverse cross-sections of age, educational background, occupation, and income level. Such granularity in demographics allows for a nuanced analysis of awareness, preferences, and potential barriers to eco-friendly sanitary waste practices.

Table 1: Demographic characteristics of study participants

Demographic Characteristics	Frequency
Age Distribution:	
Under 18	25
18-24	90
25-34	80
35-44	40
45 and above	80
Educational Background:	
Primary School	25
Secondary School	150

College/University	110
Postgraduate	30
Occupation:	
Student	55
Employed	180
Unemployed	40
Homemaker	40
Income Level:	
Low (<$5000)	95
Middle ($5000-$9999)	230
High (≥$10,000)	75

From Table 1, examining the age distribution, we observe a well-balanced representation across different age groups, offering a comprehensive understanding of attitudes and behaviors toward eco-friendly practices among both younger and older women. The prevalence of women with secondary school education signifies a diverse educational background, allowing for an exploration of how varying levels of education may impact awareness and engagement in sustainable waste practices.

Turning our attention to occupation distribution, the majority being employed indicates a significant representation of the workforce. This insight is particularly valuable in uncovering the perspectives of women managing busy professional lives, shedding light on the intersection of occupational commitments and eco-friendly sanitary waste practices. Additionally, the presence of students, homemakers, and unemployed individuals adds layers of diversity, enriching the analysis with different lifestyle contexts.

The income level distribution further contributes to the nuanced understanding of the sample. With a majority falling within the middle-income category, we can explore how financial considerations influence choices and behaviors related to sanitary waste management. The distribution across low- and high-income brackets adds granularity, enabling us to assess whether economic factors play a significant role in shaping attitudes toward eco-friendly practices. This demographic analysis lays the foundation for a comprehensive exploration of eco-friendly sanitary waste recycling within a diverse cohort of women. By delving into the interplay of age, education, occupation, and income, we aim to uncover meaningful insights that can inform targeted initiatives and interventions promoting sustainable sanitary waste practices.

Table 2: Differences among age groups in awareness, misconceptions, and effectiveness of past initiatives in eco-friendly sanitary waste recycling

Variable	Sum of Squares	Mean Square	F	Sig.
How would you rate your awareness of eco-friendly practices in sanitary waste recycling?				
Between Groups	7.375	0.819	1.168	0.315
Within Groups	254.732	0.702		
Are you aware of any myths or misconceptions related to eco-friendly sanitary waste recycling in your community?				
Between Groups	12.816	1.424	1.586	0.118

Within Groups	325.892	0.898		
How would you rate the effectiveness of these initiatives in increasing your awareness?				
Between Groups	15.021	1.669	1.602	0.113
Within Groups	378.088	1.042		

Table 2 outlines the results of ANOVA tests conducted on different variables related to eco-friendly practices in sanitary waste recycling across various age groups. The sum of squares between groups is 7.375 with 9 degrees of freedom, resulting in a mean square of 0.819. The F-statistic is 1.168 with a significance level (Sig.) of 0.315. This suggests that there is no statistically significant difference in the awareness of eco-friendly practices among different age groups. The non-significant p-value (0.315) indicates that any observed differences in awareness levels are likely due to random variation rather than age group distinctions.

The sum of squares between groups for myths or misconceptions is 12.816 with 9 degrees of freedom, yielding a mean square of 1.424. The F-statistic is 1.586, and the associated significance level is 0.118. Since the p-value is above the common significance threshold of 0.05, there is no statistically significant difference in the reported myths or misconceptions related to eco-friendly sanitary waste recycling among different age groups. The observed differences may be attributed to chance rather than age-related factors.

The sum of squares between groups for the effectiveness of past initiatives is 15.021 with 9 degrees of freedom, resulting in a mean square of 1.669. The F-statistic is 1.602, and the significance level is 0.113. Similar to the previous analyses, the p-value is greater than 0.05, suggesting that there is no statistically significant difference in how various age groups perceive the effectiveness of past awareness initiatives. Any observed variations in effectiveness ratings are likely due to random fluctuations rather than systematic age-related differences.

The ANOVA results across all three variables (awareness, myths/misconceptions, and effectiveness of past initiatives) suggest that, within the tested age groups, there are no statistically significant differences in responses. This implies that factors other than age may play a more substantial role in shaping individuals' awareness, beliefs, and perceptions regarding eco-friendly practices in sanitary waste recycling. Researchers and practitioners may need to explore other demographic or contextual factors to better understand variations in these responses. Additionally, further research could delve into interactions between age groups and other variables to uncover more nuanced insights.

Table 3: Differences among geographic areas (city, town, village, interior place) in awareness, misconceptions, and effectiveness of past initiatives in eco-friendly sanitary waste recycling

Variable	Sum of Squares	Mean Square	F	Sig.
How would you rate your awareness of eco-friendly practices in sanitary waste recycling?				
Between Groups	6.540	1.308	1.878	0.097

Within Groups	255.567	0.696		
Are you aware of any myths or misconceptions related to eco-friendly sanitary waste recycling in your community?				
Between Groups	4.729	0.946	1.039	0.394
Within Groups	333.978	0.910		
How would you rate the effectiveness of these initiatives in increasing your awareness?				
Between Groups	1.098	0.220	0.434	0.825
Within Groups	185.685	0.506		

Table 3 summarizes the results of an Analysis of Variance (ANOVA) conducted to assess the differences among geographic areas (City, Town, Village, Interior Place) concerning awareness, misconceptions, and the effectiveness of past initiatives in eco-friendly sanitary waste recycling. The sum of squares between groups is 6.540, with a mean square of 1.308. The F-statistic is 1.878, and the significance level (Sig.) is 0.097. While the p-value is slightly above the common significance threshold of 0.05, suggesting a potential trend, it does not reach statistical significance. This indicates that there may be some differences in awareness levels among geographic areas, but these differences are not conclusive.

For myths or misconceptions, the sum of squares between groups is 4.729, with a mean square of 0.946. The F-statistic is 1.039, and the significance level is 0.394. The non-significant p-value suggests that there are no statistically significant differences in reported myths or misconceptions among different geographic areas.

The sum of squares between groups for the effectiveness of past initiatives is 1.098, with a mean square of 0.220. The F-statistic is 0.434, and the significance level is 0.825. The non-significant p-value indicates that there are no statistically significant differences in how residents from different geographic areas perceive the effectiveness of past initiatives in increasing awareness.

Sanitary waste disposal is an important environmental and public health issue, especially in urban and rural settings where improper disposal is still the norm. Disposing of used sanitary pads is a challenge for many women due to a lack of information, poor access to disposal facilities, and inadequate waste segregation policies. The problem is further compounded by the lack of sanitary waste collection systems, resulting in environmental contamination and health risks for waste collectors. This research investigates the primary determinants of sanitary waste disposal behavior through the use of regression analysis. The model assesses the role of awareness, access to facilities, education level, availability of recycling, and government programs in responsible disposal practices. Through these determinants, this research aims to offer findings that can inform policy guidelines and the creation of sustainable menstrual hygiene products. To test this, the following hypotheses were developed and examined:

H1a: Awareness of sanitary waste management influences proper disposal practices among women.

H1b: Access to proper disposal facilities influences women to adopt responsible sanitary waste disposal behavior.

H1c: A higher level of education impacts sanitary waste management practices.

H1d: Awareness of government/NGO initiatives significantly influences sanitary waste disposal behavior.

H1e: The availability of recycling services influences women to engage in proper sanitary waste disposal.

Table 4: Determinants of sanitary waste disposal behavior

Independent Variables	Coefficients (β)	Standard Error	t-Value	p-Value
Awareness of Sanitary Waste Management	0.52	0.08	6.50	0.021
Access to Proper Disposal Facilities	0.45	0.07	6.43	0.013
Educational Level	0.31	0.05	6.00	0.005
Government/NGO Initiatives Awareness	0.28	0.06	4.67	0.019
Availability of Recycling Services	0.41	0.07	5.71	0.043

Table 4 presents the results of the regression analysis test statistics. The following interpretations detail the determinants of sanitary waste disposal behavior among women.

Awareness plays a significant role in determining sanitary waste disposal behavior. The positive coefficient (0.52) confirms that people who are more aware of proper sanitary waste management are more likely to dispose of waste responsibly. This finding highlights the need for more educational initiatives, workshops, and public campaigns to raise awareness about the environmental and health impacts of improper disposal.

The availability of specialized sanitary waste disposal bins or collection facilities strongly influences responsible disposal behavior. The findings indicate that women with access to suitable disposal facilities are highly likely to adopt proper waste management practices, with a coefficient of 0.45. This underscores the importance of infrastructure improvement, such as installing disposal bins in public spaces, offices, and schools to ensure proper disposal.

Education has a positive effect on waste management practices, as reflected in the β value of 0.30. Women with higher educational qualifications are more likely to be knowledgeable about proper disposal methods and concerned about environmental issues. This result highlights the importance of education in ensuring sustainable hygiene practices and implies that menstrual hygiene and waste disposal should be incorporated into school curricula.

Government and NGO-initiated menstrual hygiene programs support improved sanitary waste disposal behavior. The research identifies, with a coefficient of 0.28, that individuals who are aware of such programs are more likely to engage in responsible disposal. However, the relatively lower coefficient value compared to other variables suggests that awareness alone is insufficient—more tangible support is needed, such as subsidies for eco-friendly menstrual products or free disposal facilities.

Access to recycling services for sanitary waste is positively associated with responsible disposal habits, with a coefficient of 0.40. This finding indicates that the likelihood of proper sanitary waste disposal increases when recycling services

are available. Establishing formal recycling programs, incentivizing environmentally friendly disposal, and promoting biodegradable menstrual products could significantly reduce sanitary waste pollution.

5. Conclusion

This study evaluated public knowledge regarding eco-friendly waste recycling for sanitary items and the success rate of past programs. Different population sectors demonstrate both awareness about eco-friendly sanitary waste recycling and various misconceptions that remain unaddressed. ANOVA statistical tests showed that participant demographics including age groups and geographic standing failed to produce significant differences in waste initiative knowledge or misconceptions. The determination of sanitary waste disposal attitudes depends heavily on cultural beliefs in addition to access to disposal services and government policy implementation. Practices regarding sanitary waste disposal revealed that awareness, adequate disposal access, education standing, and governmental programs served as major determining factors in responsible disposal attitudes during regression analysis. The research outcomes emphasize that better public education improved infrastructure and sustainable solutions for recycling should be accompanied by policy interventions. Eco-friendly menstrual hygiene practices receive crucial support from community programs as well as school curricula and government campaigns. To achieve effective results all intervention programs must meet cultural requirements and remove accessibility limitations. More research must explore new methods to dispose of waste alongside technological solutions for waste management in addition to studying how awareness programs affect sustainability in sanitary waste disposal practices for the long term.

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