Plastic Periods: Public Awareness and Disposal Practices of Disposable Sanitary Pads in Rural Pulwama, Kashmir

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Abstract: *Menstrual hygiene practices have significant implications not only for individual health but also for environmental sustainability. This study examines public awareness of the environmental impacts associated with menstrual products, particularly plastic-based disposable sanitary pads. These widely used products contribute significantly to environmental degradation due to their high plastic content and improper disposal practices. The research aims to access the level of awareness regarding the hidden ecological consequences of such products, including their disposal methods and environmental footprint. Employing a mixed methods approach, the study utilized an online survey and applied karl pearson's corelation method for data analysis. The Findings reveal that the majority of participants lacked awareness of sustainable menstrual alternatives and engaged in environmentally harmful disposal practices. The study underscores the urgent need for awareness campaigns and policy interventions to promote eco-friendly menstrual hygiene practices.*

Keywords: Menstrual products, Environmental impact, Plastic based Disposable feminine hygiene products, karl pearson coorelation method, Eco-friendly menstrual options.

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Introduction

Feminine hygiene products, such as sanitary pads, are essential for maintaining women's health and enabling participation in daily activities during menstruation. However, their widespread use also entails significant environmental consequences, contributing to waste accumulation and ecological degradation (Yadav and goel, 2017). Plastic is a major contributor to environmental pollution and has been linked to various carcinogenic health effects (wiley,2023). Many industries produce goods containing plastic including sanitary products. Among these disposable sanitary pads are particularly significant with an estimated 12.3 billion pads generated globally each year (singh et al. 2019). Due to limited awareness, inadequate education and the availability of sustainable menstrual options-many women continue to rely on conventional sanitary pads, thereby contributing to the growing volume of non-biodegradable plastic waste (MHAI,2019)

Menstruation is a natural biological process occurring in females marked by the monthly discharge of blood and tissue from the uterus through the vagina when pregnancy does not happen (khan, 2019). This cycle typically begins at puberty (12-13 years of age) (-khan,2019). On average an individual menstruates monthly for approximately 40 years-using an estimated 10,000 sanitary pads over their lifetime (Asan, 2022)

In India about 77.5% of urban women and 48.2% of rural women use disposable sanitary pads, collectively generating an estimated 16,180 tonnes of menstrual waste per month and releasing harmful gases into the atmosphere (chaudhary and Bhattacharajee-2018). According to A Women's Health Right (2011), around 42.6 million women in India use sanitary pads (Garg et al., 2012), discarding an estimated 21.3 billion pads into landfills over their lifetimes (The Hindu, 2013). The environmental footprint of menstrual products is substantial, originating from the extraction and consumption of raw materials, energy, and water during manufacturing, as well as from the components used in the products themselves. Commercial sanitary pads are composed largely of non-biodegradable materials, with approximately 90% of the product made from plastic (kumar et al., 2023). This includes the leak proof base layer, the synthetic absorbent core, and even the fabric like top sheet, which is in fact a woven plastic.

Most pads contain super absorbent polymers (SAPS's), typically made from sodium polyacrylate- a non-biodegradable synthetic compound derived from acrylic acid (ASAN, 2022). These components have significant environmental implications and may also pose health risks to users.

According to Menstrual Health Alliance India, a single sanitary pad takes between 500-800 years to decompose , with each pad containing approximately 2 grams of non-biodegradable plastic-equivalent t0 four plastic bags (swati et al., 2019). Data on menstrual waste management from the Ministry of Drinking Water and Sanitation shows that 28% of menstrual waste is discarded in the open, 33% is buried and 15% is

openly burnt (Swati etal., 2019). These disposal practices pose significant risks to public health and the environment. Even products that are labeled as recyclable often end up in landfills because of the presence of some organic matter making them unsuitable for processing and become unacceptable in some recycling facilities.

This issue is further worsened by the absence of advanced waste management systems and a lack of clear guidelines regarding the classification and disposal of feminine hygiene products , which hampers the promotion of safe and sustainable menstrual waste practices. The packaging of the products is also a great source of waste, about 400 pounds of period products packaging is thrown out per women per lifetime (wiley,2022).The world's oceans and marine ecosystem are also affected by period products . As disposable menstrual products and their plastic packaging break down, they release micro-plastics into the environment. These micro-plastics disrupt ecosystems and pose a serious threat to aquatic life. when menstrual products are flushed down the toilet, they can directly affect marine environment , infact , they are the most frequently found waste items on beaches and in oceans around the world (Wiley,2022).

Significance of The Study

This study is an important piece of research as although this is the current burning concern of environment but unfortunately negligible research work has been done on the topic not only in the pulwama district or in union territory but also very less research publication are available on the above said topic in whole country. The study characterizes how much percentage of females are using sanitary pads, the waste generated by sanitary pads, methods of disposal of this waste used by people and its impact on environment More over the study also highlights the need to address this burning issue which has been mostly by ignored by researchers till date.Disposable feminine hygiene products such as sanitary pads are widely used across globe, yet their environmental impacts have received limited attention in environmental and public health literature. Studies such as Sommer et al.(2016) and Van Leeuwen S Torondel (2018) highlight the lack of sustainable menstrual waste disposal systems, especially in low and middle income countries, leading to improper waste management and increased plastic pollution. Similarly, kaur et al.(2020) underline the chemical and plastic composition of sanitary napkins, which contributes to non- biodegradable waste, yet little has been done to quantify public awareness or behavioral patterns regarding disposal practices. Despite these contributions, existing studies often focus either on menstrual health education or on general solid waste management, with few explicitly connecting menstrual product usage to environmental degradation. Furthermore, most research lacks a localized analysis of public awareness levels, especially in the context of cultural taboos, policy implementation and the actual on –ground waste management practices related to menstrual hygiene products. This study aims to bridge these gaps by examining both the environmental implications of disposable menstrual products and the level of public awareness regarding their disposal . By integrating environmental analysis with social behavior and waste management practices, this research provides a

comprehensive understanding of how current practices contribute to environmental stress. Additionally, this study offers context-specific insights that can inform awareness campaigns, policy making and the promotion of Sustainable alternatives such as biodegradable products.

In doing so, This research contributes to the emerging discourse on green menstruation and sustainable menstrual hygiene management, addressing a crucial yet under-researched intersection of gender, environment , and public health.

Methods

The study's methodology and materials vary depending on the different parameters of the study, That is why the process has been divided into different parts and sections based on the methods used and the data utilized. An extensive literature review was conducted to get an over view about the topic, establishes theoretical framework for the topic, identified the research gaps in this topic. This paper is based on both primary data as well as on secondary data. The primary data was produced by Questionnaire method [google forms] sample size was 100 , from 5 sample sites : (Sirnoo village, Quesbayaar village, Rajpora Village, Gulshanabad Village and Wagum Village) 20 respondents from each village, after that analysis of collected data has been done by different statistical tools and methods. The data gives idea related to quantity of menstrual waste produced by females during menstruation and help us to estimate its impact on environment and gives idea about how much awareness females have related to eco-friendly menstrual products, menstrual usage pattern and disposal methods used by them. This study also uses Karl pearson correlation method to depict correlation between various variables. Also used direct observation and visualization method to visit the dumping sites of waste

By collecting both primary and secondary data, the study aimed to get comprehensive and intense information on the topic impact of disposable feminine products (sanitary pads) on environment in pulwama. Data from Questionnaires that have been obtained from different villages in Pulwama district have been analyzed and processed to gain insights and identify research gaps in concerned topic.. All the data has been has been later compiled, analyzed, compared and also represented in the form of graphs, Diagrams, tables, map charts and other cartographic and statistical techniques in order to produce authentic and accurate results through the use of these diverse methods and enable researchers to make reliable conclusions about the present piece of research.

Limitations of The Study

This study was conducted only among 100 participants due to time limitation and hesitation of participants to provide information ,as menstruation is still considered a socio-cultural taboo and respondents are not ready to discuss it frankly. This study has been conducted in villages of pulwama district. However, the status of awareness on menstrual hygiene will differ among different areas within the

country as well as from country to country. Therefore, more research need to be conducted on larger samples to understand the level of awareness among females regarding impact of plastic based menstrual products on environment.

Results

Primary Menstrual product used by Respondents

The data collected from the online questionnaire survey respondents of 5 villages of pulwama depicts that when comparing between various disposable feminine hygiene products maximum female population about 92% prefer to use plastic based sanitary pads while ony a small fraction opt for cloth pads, menstrual cups, or other alternatives. Given 4 options, we get to infer that 92% of females use sanitary pads, 3% uses reusable cloth,3% uses cloth ,2% uses tampons.

Number of Sanitary pads used per menstrual cycle

When asked to respondents about how many sanitary pads on an average they use during one of menstrual cycle , About 66% females reported that they use 6-10 pads during one period cycle, 17% reported 11-15 sanitary pads they use during one menstrual cycle and 14% use 1-5 sanitary pads only, 3% uses more than 15 sanitary pads during one menstrual cycle which indicates possibility of massive generation of sanitary pad waste which remains in landfills for 500-800 years un-decomposed.

Awareness of Decomposition Time of Regular sanitary pads

When asked about decomposition time a single sanitary pad requires About 38.1% of respondents of our sample survey that average decomposition period of sanitary pad is less than 1 year, 27.8% reported that it is 1-10 years, 14.4% reported that it is 10-50 years and 19.6% reported it takes more than 500 years.

Experience with Alternatives to disposable sanitary pads

When asked about sustainable alternatives to disposable sanitary pads like menstrual cups, reusable pads) about 73.7% females of our sample reported that they have never used any alternative to sanitary pads, and only 26.6% reported that they have tried alternatives to sanitary pads.

Perception of availability of information on Eco-friendly menstrual products

When asked about availability of information on eco-friendly menstrual products About 44.9% females of our survey believes that there is not much information available regarding eco-friendly menstrual products, only 28.5% reported that there is information available and 28.6% are not sure about it.

Methods of disposal of used sanitary pads

When asked about way of disposal of used sanitary pads,About 43.9% of females of our sample throw sanitary pads in regular trash, 26.5% dispose them in designated bins, 7.1% compost biodegradable pads, 6.1% flush them in toilet and 16.3% use other methods for disposal.

Factors that may encourage women to use sustainable menstrual hygiene products
When asked respondents about which factors may encourage to shift their choice from plastic based sanitary pads to eco-friendly menstrual hygiene products, About 70.7% of female respondents of our sample agrees that better comfort and reliability factor attracts women to go for sustainable menstrual products, 56.6% thinks it is awareness about environmental benefits, 50.5% believes it is lower price, 47.5% thinks it is availability of product, 37.4% thinks it is social advertisement, and 21.2% thinks it is other factors which attract people to go for more sustainable menstrual product.

1 used sanitary pad = 2 gram non-biodegradable waste (Arena et al., 2016)
CORELATION BETWEEN USAGE OF SANITARY PADS WITH NON-BIODEGRADABLE WASTE ACCUMULATION

The collected primary data from sample sites was tabulated and analyzed to examine the relationship between the average number of sanitary pads used per girl per month(X) and waste generated from pads in grams per month (Y).

Karl pearson's coefficient of correlation(r) was used to determine the strength and direction of the linear relationship between these two variables. The formula applied is:
$r = \Sigma dXdY / \sqrt{(\Sigma dx^2 \Sigma dy^2)}$

Sample villages	**X (**average no, of pads used by one girl/ month	**Y(**waste generate d from pads in grams/m onth	**Dx(x-x))**	**Dx^2**	**Dy(y-y))**	**Dy^2**	**ΣdXdY**
SIRNOO	9	***9×2=18***	**1**	**1**	**2**	**4**	**2**
QUESBA YAR	8	**8×2=16**	**0**	**0**	**0**	**0**	**0**
GULSHA NABAD	7	**7×2=14**	**-1**	**1**	**-2**	**4**	**2**
RAJPOR A	7	**7×2=14**	**-1**	**1**	**-2**	**4**	**2**
WAGAM	9	**9×2=18**	**1**	**1**	**2**	**4**	**2**

$r = \Sigma dXdY/\sqrt{(\Sigma dx2 \Sigma dy2)}$
$r = 8/\sqrt{4\times16}$
$r=8/\sqrt{64}$ $r=8/8$ $r=+1$
The karl pearson's correlation coefficient between the average number of pads used and waste generated per girl per month was found to be +1 , indicating perfect positive linear relationship. This suggests that as the number of pads used per girl increases, the non-biodegradable waste generated from sanitary pads also increases significantly.

Discussion

In answering our research question, this paper shows that preference for sanitary pads than other menstrual hygiene products is likely influenced by factors such as ease of availability, convenience, social acceptability and aggressive marketing by commercial brands (kaur et al., 2020). Similarly ,a study reported that women in india show a strong inclination towards disposable pads despite rising awareness about menstrual cups and reusable clothpads (Singh et al. (2021).These findings indicate that while sanitary pads remain the most preferred option, there is a need for increased awareness and promotion of eco-friendly alternatives to address environmental concerns. The study also indicates that around 45% of the respondents were unaware about availability of eco-friendly menstrual options such as menstrual cups, biodegradable pads, or reusable cloth pads. This lack of awareness can be attributed to inadequate menstrual education and limited availability of reliable information, particularly in rural and semi-urban areas (Bharadwaj S patkar, 2004). Similar observations were made by Garg et al.(2012), who found that many adolescent girls in india had minimal understanding of the environmental impact of menstrual waste. Likewise, Anwar et al (2022) reported that despite increasing global emphasis on sustainable menstrual products, awareness and adoption in developing countries remain extremely low due to social stigma and poor outreach.This knowledge gap poses a significant challenge to sustainable menstrual waste management.

Without awareness of the long decomposition period, women may not perceive the urgency to adopt greener options. Educational campaigns, community-level workshops and policy support are therefore crucial to promote informed choices and environmentally responsible menstrual hygiene practices. Present study revealed that about 73.7% of the respondents have never used any eco-friendly alternatives to disposable sanitary pads, such as reusable cloth pads , menstrual cups or biodegradable sanitary napkins. This finding suggests that while there is growing discourse around sustainable menstruation, actual adoption remains low, particularly in contexts where traditional disposable pads dominate the market. Factors contributing to this include limited awareness, cultural taboos surrounding reusable products, concerns about convenience and hygiene and inadequate access to affordable alternatives (van Eijik et al., 2016). Other studies also support these observations like supriya et al.(2021) found that only 10-15% of women in urban india had experimented with menstrual cups, primarily due to lack of knowledge and fear of using internal products. Similarly Hennegan et al.(2019) highlighted that social stigma and poor menstrual education remain major barriers to the adoption of reusable menstrual products in low and middle income countries.These findings highlight the need for targeted awareness programs, community outreach, and policy interventions to make eco-friendly menstrual products accessible, acceptable and affordable. Improving menstrual health literacy could help bridge this gap and support sustainable waste management practices.

This study highlights that a significant proportion of respondents around 43.9% dispose used sanitary pads by throwing them in regular household trash ,while some percentage

reported flushing them down the toilet. These findings indicate that unsafe and environmentally harmful disposal practices are prevalent, likely due to lack of awareness, inadequate waste management infrastructure and social taboos surrounding menstruation waste (kansal et al., 2016). Similar disposal trends have been documented in other studies. Like Nair et al (2020) found that a majority of urban women in India dispose of pads with general household waste, often without wrapping , leading to unhygienic conditions for waste collectors. A study by patkar (2011) also emphasized that flusing pads is a common but problematic practice, causing frequent blockages in sewage systems and increasing maintenance costs. Improper disposal not only poses serious environmental challenges, contributing to non-biodegradable landfill waste, but also endangers the health and dignity of sanitation workers who handle this waste manually. These insights underscore the need for awareness programs on safe disposal methods, promotion of biodegradable options, and the provision of dedicated menstrual waste bins and incinerators at community and institutional levels.

The study findings reveal that among respondents who have expressed willingness to adopt eco-friendly menstrual products, the primary motivating factors are better comfort and affordability. Approximately 70% respondents highlighted that better comfort factor and about 50% highlighted cost factor can primarily motivate them to use eco-friendly menstrual options if they are more comfortable and affordable as compared to disposable sanitary pads. This indicates that while environmental concerns do play a role , practical aspects like physical comfort and economic savings are strong drivers of behavioral change. This is supported by (van Eijik et al.(2019), who found that women in low-income settings were more likely to switch to menstrual cups when they perceived them as more comfortable and cost effective in the long run. Similarly , Schmitt et al.(2017) noted that adolescents were more receptive to sustainable products when they addressed comfort, convenience and cost simultaneously.

These findings imply that future interventions to promote green menstrual products should emphasize user comfort and cost –benefit messaging, alongside environmental impact . Local governments, NGOs and social enterprises could leverage this by offering subsidized rates, awareness campaigns demonstrating comfort benefits, and trial kits for first time users.

To further understand the environmental implications of menstrual hygiene practices, a statistical analysis was conducted using karl pearson's correlation coefficient to examine the relationship between the average number of disposable sanitary pads used per person per month and the amount of non-biodegradable waste generated.The results revealed a perfect positive correlation (r=+1.00) between these two variables. This indicates that as the usage of disposable sanitary pads increases, the generation of non-biodegradable menstrual waste also rises proportionately.This finding underscores a significant concern: disposable sanitary pads are predominantly made of non-biodegradable materials such as superabsorbent polymers, plastics and adhesives, which takes 500-700 years to decompose fully(BhardwajSpatkar,2004). Thus higher consumption directly translates into larger volumes of plastic- based menstrual waste

emtering landfills and clogging waste streams. Similar correlations have been highlighted in studies like (sharma et al.(2018) emphasized that the widespread preference for disposal methods and the absence of sustainable waste management solutions. Garg et al.(2012) also noted that in urban and semi-urban areas the rising demand for commercial sanitary napkins correlates strongly with increased non-biodegradable waste loads. This implication of this

perfect positive relationship is critical for policy makers, waste management authorities , and public health advocates. There is an urgent need for awareness campaigns that not only educate women about the environmental impact of disposable pads but also encourage the adoption of sustainable menstrual alternatives, such as reusable cloth pads, menstrual cups and biodegradable napkins.Moreover, the results highlight the importance of establishing dedicated collection, segregation, and safe disposal systems for menstrual waste, which remain largely inadequate in many developing regions. Overall, this statistical insight reinforces the need for multi-pronged approach combining education, policy intervention, and infrastructural improvements to address the environmental burden associated with conventional menstrual products.

Recommendations

We should promote sustainable alternatives and should advocate plastic based sanitary pad waste reduction by focusing on reusable products.(reusable pads, reusable tampons, reusable panties). Introduce government incentives and subsidies for sustainable menstrual products to make them more affordable and accessible. To effectively tackle the growing environmental challenge posed by plastic-based sanitary waste, it is crucial to promote sustainable menstrual alternatives and actively advocate for a reduction in plastic usage in feminine hygiene products.one of the most impactful strategies is to shift focus towards the use of reusable products such as menstrual cups, reusable cloth pads and biodegradable sanitary products.These alternatives not only help to reduce the volume of non-biodegradable waste entering landfills and water bodies, but they also offer long-term economic benefits to users due to their reusability over multiple menstrual cycles and also encourage a behavioral shift towards eco-friendly menstrual hygiene practices.

Encourage research and development into fully biodegradable sanitary pads, utilizing natural materials such as banana fiber, bamboo, or organic cotton. A critical step towards minimizing the environmental footprint of menstrual products is to invest in research and development of fully biodegradable sanitary pads. Most commercially available pads contain up to 90% plastic, which takes hundreds of years to decompose and contributes significantly to environmental pollution.Therefore, developing alternatives that decompose naturally and safely is essential for sustainable menstrual hygiene management.Innovative use of natural and locally available materials such as banana fiber, bamboo pulp, water hyacinth, organic cotton presents a promising solution. These materials are not only biodegradable but also possess high absorbency and are gentle on the skin, making them suitable for menstrual care. Encouraging

scientific research, pilot projects, and startup incubation in this domain can lead to the large-scale production of eco-friendly sanitary pads.

Propose dedicated menstrual product disposal bins and incinerators in public places and schools to manage waste more effectively. Support initiatives for segregating menstrual waste from general waste. Proper disposal of menstrual waste remains a critical yet often neglected component of waste management. To address this, it is essential to propose the installation of dedicated menstrual product disposal bins and eco-friendly incinerators in public places, schools, colleges, and workplaces. These specialized facilities can ensure that used sanitary products are handled hygienically, thereby reducing health hazards, odor and environmental pollution caused by the improper disposal of pads in open spaces or toilets.

Launch awareness campaigns targeting schools, colleges, and communities to educate women about the environmental impact of single –use sanitary pads. Promote environmental literacy on menstrual hygiene practices and encourage the adoption of greener menstrual products.

Raising awareness is fundamental to transforming menstrual hygiene behavior and reducing environmental harm caused by single-use sanitary products. Awareness campaigns about ecological consequences of conventional disposable pads and benefits of adopting reusable or biodegradable alternatives. These campaigns should not only promote environmental literacy but also address cultural taboos and misinformation surrounding menstruation. By integrating menstrual education into school curricula and community health programs, young people can be empowered early on to make conscious and sustainable choices. Additionally, involving educators, health workers, and local influencers can amplify the reach and impact of such initiatives. When awareness is paired with access to greener products, it can significantly increase their acceptance and long –term use, ultimately fostering both environmental sustainability and menstrual dignity.

Advocate for regulations that require manufacturers to label products with their environmental impact (e.g plastic content, decomposition time). Push for policies that regulate the production of plastic –heavy sanitary products and encourage mandatory corporate responsibility for post-consumer waste. To promote transparency and accountability in menstrual product manufacturing , it is imperative to advocate for regulations that require companies to label their products with clear information about their environmental impact.

Such labeling can empower consumers to make informed choices and shift demand towards eco-friendly alternatives. Additionally, stricter policies must be introduced to regulate the production and distribution of plastic heavy sanitary products, which are a a major contributor to long-term non-biodegradable waste.

Propose the development of circular economy models in the menstrual hygiene sector, where products are designed to be Reused, Recycled, or safely composted. Recommend local waste recycling initiatives or partnerships that convert waste sanitary products into energy or other valuable resources. This approach emphasizes designing products that can be reused, recycled, or safely decomposed, thus minimizing waste generation and resource depletion. Local waste recycling efforts not only reduce environmental stress but also create livelihood opportunities in the waste management sector. Embedding circular economy principles into menstrual hygiene policies ensures a more sustainable , inclusive, and forward-looking system.

Huge cost difference between the organic options and non-organic options is a major hindrance. Tax rebates, subsidies must be issued if a tested organic product releases in the market in order to obtain a significant customer shift. Despite environmental and health benefits , organic products remain inaccessible to many due to their higher price point. To overcome this hurdle, it is essential to introduce GST exemptions on certified organic menstrual products. These financial incentives can help reduce retail prices and make sustainable alternatives more affordable for the general population. Government backed support would not only encourage manufacturers to produce eco-conscious products at scale but also promote a meaningful shift in consumer behavior. Making organic options economically competitive is a crucial step toward mainstreaming green menstrual choices and achieving broader environmental goals.

Recommend the adoption of block-chain technology to create transparent and verifiable tracking systems for sanitary pad production, use and disposal .This could help monitor the entire lifecycle of a sanitary product, ensuring responsible disposal and encouraging recycling. Encourage the development of blockchain platforms that could facilitate consumer participation in tracking their waste footprint, thereby raising awareness and driving behavioral changes in menstrual waste disposal practices.

Conclusion

By this research we can conclude that awareness and knowledge about eco-friendly menstrual products must be encouraged because it will ultimately help to reduce negative consequences of non-biodegradable The above mentioned recommendations could be executed gradually as a minor step can have great results so far as sustainability is concerned.Administration must pay heed to proper management of disposal facilities of menstrual waste, like availability of disposal bins, proper check on manufacturing process and make them follow sustainable production practices and also keep a check on proper labeling of menstrual products, more and more availability of sustainable alternatives in market.Government should provide subsidies on sustainable menstrual products and try to make them cheaper , accessible and comfortable than plastic based products, these factors will definitely attract females towards sustainable menstrual options.

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Ethics Declaration:- The study involved voluntary participation through anonymous surveys. All respondents provided informed consent prior to participation. Ethical approval was not required as per institutional and national research guidelines.