RESEARCH PAPER

Menstrual Hygiene Management (MHM) Among Adolescent Girls in the Hilly Districts of Uttarakhand: A Cross-Sectional Analysis of Socio-Ecological and Topographical Barriers

Saloni[1], Sonam Youdon[2], Anisha Parveen[3], Gopal[4], Ms. Kritika Saxena[5], Sonar Disha Sunil[6], Bintu Maria Miller[7], Shivshankar Tiwari[8]

[1] Student, Master of Public Health, Uttaranchal College of Health Sciences, Uttaranchal University, Dehradun, Uttarakhand, India. ORCID: 0009-0004-0267-5391, Email: salonayyy2003@gmail.com

[2] Student, Master of Hospital Administration, Uttaranchal College of Health Sciences, Uttaranchal University, Dehradun, Uttarakhand, India. ORCID: 0009-0006-9848-477X, Email: sonamyoudon68@gmail.com

[3] Student, Master of Public Health, Uttaranchal College of Health Sciences, Uttaranchal University, Dehradun, Uttarakhand, India. ORCID: 0009-0006-4460-2291, Email: anishaparveen141@gmail.com

[4] Assistant Professor, Uttaranchal College of Health Sciences, Uttaranchal University, Dehradun, Uttarakhand, India. ORCID: 0009-0009-0220-0456, Email: gopal4god11@gmail.com

[5] Assistant Professor, Uttaranchal College of Health Sciences, Uttaranchal University, Dehradun, Uttarakhand, India. ORCID: 0009-0007-5973-2192, Email: saxena.kritik02@gmail.com

[6] Student, Master of Hospital Administration, Uttaranchal College of Health Sciences, Uttaranchal University, Dehradun, Uttarakhand, India. ORCID: 0009-0004-7591-7582, Email: dishasonar0007@gmail.com

[7] Student, Master of Public Health, Uttaranchal College of Health Sciences, Uttaranchal University, Dehradun, Uttarakhand, India. ORCID: 0009-0009-6413-1652, Email: bintumiller8@gmail.com

[8] Assistant Professor, Uttaranchal College of Health Sciences, Uttaranchal University, Dehradun, Uttarakhand, India. ORCID: 0009-0006-4248-3487, Email: shivshankartiwari@gmail.com

ABSTRACT

Menstrual Hygiene Management (MHM) constitutes a critical determinant of adolescent reproductive health, psychosocial well-being, educational continuity, and gender equity (Sommer et al., 2016). Despite increasing policy recognition in India, geographically isolated and culturally conservative regions continue to experience systemic gaps in implementation (van Eijk et al., 2016). The present study investigates the awareness, socio-cultural barriers, infrastructural constraints, and educational implications of MHM among adolescent girls in the hilly districts of Uttarakhand. Using a descriptive cross-sectional design, data were collected from 1,200 school-going girls (aged 12–18 years) across Almora, Pauri Garhwal, and Uttarkashi districts through a structured questionnaire and institutional assessment checklist. Findings indicate that although 82% of respondents had basic awareness of menstruation as a physiological process, only 34% demonstrated accurate knowledge of reproductive anatomy. Approximately 68% reported experiencing fear or shock at menarche (McMahon et al., 2011). Socio-cultural restrictions remain prevalent, with 74% reporting kitchen bans and 38% facing restrictions from religious participation. Institutional assessment revealed that only 41% of schools had functional toilets with consistent water supply, and merely 22% had safe disposal mechanisms such as incinerators. A statistically significant association was observed between inadequate WASH facilities and school absenteeism ($p < 0.05$). The study highlights the compounded impact of topography, water scarcity, patriarchal norms, and weak supply chains in shaping menstrual vulnerability in hill-specific contexts (Joshi, Buit, & González-Botero, 2015). It proposes a multi-sectoral policy framework integrating education, WASH infrastructure, community engagement, and decentralized supply mechanisms to enhance menstrual dignity in mountainous terrains.

Keywords: Menstrual Hygiene Management, Adolescent Health, Uttarakhand, WASH, School Absenteeism, Cultural Taboos, Reproductive Health

How to cite this article: Saloni, Youdon S, Parveen A, Gopal, Saxena K, Sunil S D, Miller B M, Tiwari S. Menstrual Hygiene Management (MHM) Among Adolescent Girls in the Hilly Districts of Uttarakhand: A Cross-

Sectional Analysis of Socio-Ecological and Topographical Barriers. Int J Drug Deliv Technol. 2026;16(14s): 767-770. DOI: 10.25258/ijddt.16.14s.88.
Source of support: Nil
Conflict of interest: None

1. INTRODUCTION

1.1 The Global Landscape of Menstrual Hygiene Management

Menstruation is a universal biological phenomenon experienced by nearly half the global population for a significant portion of their lives. Yet, it remains enveloped in silence, stigma, and structural neglect (Bobel, 2019). The World Health Organization (WHO) and UNICEF (2012) define Menstrual Hygiene Management as the use of clean absorbent materials that can be changed in privacy as often as necessary, access to soap and water for washing, and facilities for safe disposal of used materials. Despite global development efforts, an estimated 500 million women and girls worldwide lack adequate facilities for managing menstruation safely and with dignity (World Bank, 2018).

In low- and middle-income countries, menstrual health intersects with poverty, gender discrimination, inadequate infrastructure, and limited reproductive education (Sommer et al., 2016). Poor menstrual hygiene is linked to reproductive tract infections, urinary tract infections, school absenteeism, psychosocial stress, and long-term educational discontinuation (Sumpter & Torondel, 2013). India, home to over 120 million adolescent girls, has made progress through national programs and policy frameworks. However, disparities persist across geography, caste, class, and rural-urban divides (Garg & Anand, 2015).

1.2 Menstruation in the Himalayan Context: The Uttarakhand Reality

Uttarakhand presents a unique developmental paradox. While celebrated as “Devbhoomi” for its spiritual and ecological heritage, its mountainous terrain imposes infrastructural and logistical challenges that directly affect health service delivery. The districts of Almora, Pauri Garhwal, and Uttarkashi are characterized by high-altitude settlements, scattered populations, limited transport connectivity, and seasonal water scarcity.

Topographical barriers amplify menstrual vulnerability. Long uphill treks to school, limited access to piped water, and absence of waste disposal systems transform menstruation from a physiological process into a logistical and emotional burden (Lahiri-Dutt, 2015).

1.3 Conceptual Framework

This study adopts an integrated socio-ecological framework to analyze MHM (Hennegan et al., 2019). The framework conceptualizes MHM as influenced by four interlinked domains:

Individual Level: Knowledge, attitudes, biological literacy, psychological preparedness.

Interpersonal Level: Mother-daughter communication, peer influence, teacher guidance.

Institutional Level: School infrastructure, availability of WASH facilities, disposal systems.

Socio-Cultural and Environmental Level: Traditional beliefs, ritual restrictions, water scarcity, geographical isolation.

2. LITERATURE REVIEW

2.1 Historical Construction and Knowledge Gaps

Across civilizations, menstrual blood has been framed alternately as sacred and impure. In many Himalayan communities, menstruation is associated with ritual impurity (Kumar & Srivastava, 2011). Research across India indicates that a majority of girls are unaware of menstruation prior to menarche. Santhya and Jejeebhoy (2015) observed limited pre-menarche education in rural settings. In mountainous Uttarakhand, silence is further intensified by conservative norms, where menarche often arrives without explanation, interpreted as injury or illness (McMahon et al., 2011).

2.2 Infrastructure and Economic Determinants

The Joint Monitoring Programme for Water Supply and Sanitation emphasizes that MHM cannot exist without water (WHO & UNICEF, 2020). Hill districts face chronic water shortages due to drying springs and gravity-fed systems vulnerable to winter freeze (Winkler et al., 2015). Transition from reusable cloth to disposable sanitary napkins is often considered progress, yet mountainous supply chains remain fragile (Phillips-Howard et al., 2016). Absence of disposal systems forces girls to bury used pads or burn them unsafely, which heightens embarrassment and absenteeism (Das et al., 2015).

3. METHODOLOGY

3.1 Study Design and Sample

A descriptive cross-sectional research design was employed across three districts: Almora, Pauri Garhwal, and Uttarkashi. A multi-stage stratified random sampling method was used to select 1,200 adolescent girls aged 12–18 years from both government (58%) and private (42%) schools.

3.2 Data Collection
A pre-tested semi-structured questionnaire was utilized to gather socio-demographic data, awareness levels, and hygiene practices. Additionally, an institutional observational checklist assessed toilet functionality, water availability, and disposal systems within the selected schools.

4. RESULTS AND STATISTICAL ANALYSIS
4.1 Socio-Demographic Profile
The mean age of respondents was 14.9 years (SD ± 1.7). Parental education was low, with 24% of mothers being illiterate and 62% of respondents belonging to low-income households (monthly income below ₹10,000).

4.2 Awareness and Sources of Information
Pre-Menarche Awareness: Only 54% of respondents had heard about menstruation before menarche.

Experience: 68% described their first experience as "frightening" or "confusing."

Information Source: Mothers (46%) were the primary informants, followed by peers (21%) and teachers (15%). However, maternal information focused largely on restrictions rather than biological facts.

4.3 Hygiene Practices and Cultural Restrictions
Absorbents: 61% used commercial sanitary napkins, while 34% used reusable cloth. Cloth users (42%) reported drying materials indoors due to privacy concerns, increasing infection risks (Das et al., 2015).

Restrictions: Kitchen entry bans (74%) and religious restrictions (38%) remain prevalent, particularly in remote blocks ($p < 0.05$) (Kumar & Srivastava, 2011).

4.4 Institutional Assessment and Absenteeism
The observational checklist highlighted a functionality gap:

Functional toilets: 67%

Continuous water supply: 41%

Incinerator facility: 22%

Absenteeism: 37% of respondents reported missing school during menstruation. Lack of functional toilets (48%) and severe pain (26%) were the primary reasons. Statistical analysis showed that girls without water access in schools were 2.3 times more likely to report absenteeism ($p < 0.05$) (Sumpter & Torondel, 2013).

5. DISCUSSION AND THEORETICAL INTEGRATION
5.1 The Geography-Gender Nexus
Mountainous terrains complicate supply chains and water distribution (Joshi, Buit, & González-Botero, 2015). The gravity-fed water systems common in hill schools are susceptible to seasonal breakdown, transforming physical geography into a gendered barrier. MHM in hill regions is not simply a health issue; it is a systems issue where topography acts as a determinant of health.

5.2 Capability Deprivation
Situating these findings within Amartya Sen's Capability Approach (Sen, 1999), MHM in Uttarakhand is a matter of capability deprivation (Hoffmann, 2019). When girls lack access to water, privacy, or accurate knowledge, their capability to attend school and maintain bodily dignity is restricted.

5.3 Comparison with National Trends (NFHS-5)
While NFHS-5 reports rising adoption of hygienic menstrual methods (IIPS, 2021), this study found only 61% usage in selected hill districts, compared to higher averages in plains regions. This "topographical inequity" highlights that altitude correlates inversely with infrastructural reliability.

6. ENVIRONMENTAL AND SUSTAINABILITY CONSIDERATIONS
Mountain ecosystems are fragile. In remote hill schools lacking incinerators, pads are buried in shallow pits or thrown into ravines, posing risks of soil and water contamination (Elledge et al., 2018). Sustainable policy must balance menstrual dignity with ecological preservation through biodegradable products and solar-powered incineration (Kaur, Kaur, & Kaur, 2018).

7. INTEGRATED POLICY ROADMAP
7.1 Five Pillars for Hill-Specific Reform
Water Security: Spring rejuvenation projects and rainwater harvesting dedicated to school girls' toilets.

Comprehensive Education: Curriculum integration beginning Grade 6, including training for male teachers to normalize discussion.

Product Strategy: Decentralized production units managed by women's self-help groups to reduce transport costs.

Infrastructure Accountability: Digital reporting of water availability and annual functionality audits.

Cultural Dialogue: Engagement with village elders and faith-based leaders to reinterpret restrictive practices.

8. CONCLUSION
Menstrual hygiene management in the hilly districts of Uttarakhand reflects a convergence of geography, gender norms, and infrastructural neglect. Addressing these systemic gaps requires a move beyond "infrastructure counting" toward a multi-sectoral framework that ensures menstrual dignity through geographical sensitivity and community empowerment.

REFERENCES

1. Bobel, C. (2019). The managed body: Developing girls and menstrual health in the Global South. Palgrave Macmillan.
2. Das, P., et al. (2015). Menstrual hygiene practices, WASH access and the risk of urogenital infection in women from Odisha, India. PLOS ONE, 10(6), e0130777.
3. Dasra. (2014). Spot On! Improving menstrual health and hygiene in India. Dasra.
4. Elledge, M. F., et al. (2018). Menstrual hygiene management and waste disposal in low and middle income countries—A review of the literature. International Journal of Environmental Research and Public Health, 15(11), 2562.
5. Garg, S., & Anand, T. (2015). Menstruation related myths in India: Strategies for combating it. Journal of Family Medicine and Primary Care, 4(2), 184-186.
6. Hennegan, J., et al. (2019). Women's and girls' experiences of menstruation in low- and middle-income countries: A systematic review. PLOS Medicine, 16(5), e1002803.
7. Hoffmann, V. (2019). Amartya Sen's Capability Approach and its implications for menstrual equity. Journal of Human Development and Capabilities, 20(4), 450-465.
8. House, S., Mahon, T., & Cavill, S. (2012). Menstrual hygiene matters: A resource for improving menstrual hygiene. WaterAid.
9. International Institute for Population Sciences (IIPS). (2021). National Family Health Survey (NFHS-5), 2019–21: India. Ministry of Health and Family Welfare.
10. Joshi, D., Buit, G., & González-Botero, D. (2015). Menstrual hygiene management: Education and empowerment for girls? Waterlines, 34(1), 51-67.
11. Kaur, R., Kaur, K., & Kaur, R. (2018). Menstrual hygiene, management, and waste disposal: Challenges faced by girls of developing countries. Journal of Environmental and Public Health, 2018, 1730964.
12. Kumar, A., & Srivastava, K. (2011). Cultural and social practices regarding menstruation among adolescent girls. Social Work in Public Health, 26(6), 594-604.
13. Lahiri-Dutt, K. (2015). Medicalising menstruation: A feminist critique of the political economy of MHM in South Asia. Gender, Place & Culture, 22(8), 1158-1176.
14. Mahon, T., & Fernandes, M. (2010). Menstrual hygiene in South Asia: A neglected issue for WASH programmes. Gender & Development, 18(1), 99-113.
15. McMahon, S. A., et al. (2011). Investigating the scale and dynamics of stigma associated with menstruation in a rural school in western Kenya. Global Public Health, 6(6), 611-627.
16. Phillips-Howard, P. A., et al. (2016). Menstrual cups and sanitary pads to reduce school attrition: A cluster randomised controlled feasibility study. BMJ Open, 6(11), e013229.
17. Santhya, K. G., & Jejeebhoy, S. J. (2015). Sexual and reproductive health and rights of adolescent girls. Global Public Health, 10(2), 189-221.
18. Sen, A. (1999). Development as freedom. Oxford University Press.
19. Sommer, M., et al. (2016). A time for global action: Addressing girls' menstrual hygiene management needs in schools. PLOS Medicine, 13(2), e1001962.
20. Sumpter, C., & Torondel, B. (2013). A systematic review of the health and social effects of menstrual hygiene management. PLOS ONE, 8(4), e62004.
21. van Eijk, A. M., et al. (2016). Menstrual hygiene management among adolescent girls in India: A systematic review and meta-analysis. BMJ Open, 6(3), e010290.
22. Winkler, I. T., Roaf, V., & Sommer, M. (2015). Menstrual hygiene management: Policy-making from a human rights perspective. Waterlines, 34(1), 21-36.
23. World Bank. (2018). Menstrual hygiene management enables women and girls to reach their full potential. World Bank Group.
24. WHO & UNICEF. (2020). Progress on drinking water, sanitation and hygiene in schools. Joint Monitoring Programme.