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Rural–Urban Variations in Menstrual Hygiene Management among School-going Girls: A Comparative Cross-sectional Study

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Abstract

Menstrual hygiene management (MHM) is a critical component of adolescent reproductive health and well-being. However, variations in access to menstrual health information, sanitation facilities, and hygienic practices persist between rural and urban populations, particularly in low and middle-income countries. Understanding these geographical inequalities is essential for developing equitable menstrual health interventions. This study compared menstrual hygiene knowledge, attitudes, and practices among adolescent girls residing in urban, suburban, and rural areas of West Bengal, India.

A school-based comparative cross-sectional study was conducted among 2,119 school-going girls aged 12–18 years from eighteen schools in thirteen districts of West Bengal. Participants were selected using a multistage sampling technique. Data were collected through face-to-face interviews using a pre-tested structured study schedule. Descriptive statistics, Chi-square tests, one-way analysis of variance (ANOVA), post hoc multiple comparison tests, Pearson's correlation, and multiple linear regression analyses were performed using IBM SPSS Statistics. A p-value of <0.05 was considered statistically significant.

Significant rural–urban differences were observed across all domains of menstrual hygiene management. Urban adolescents demonstrated significantly higher mean scores for menstrual hygiene knowledge, attitudes, hygiene practices, and media exposure than their suburban and rural counterparts. Post hoc analysis confirmed significant differences between urban and both suburban and rural groups. Chi-square analysis further demonstrated significant associations between habitat and menstrual hygiene knowledge, attitudes, practices, and media exposure. The strongest association was observed for menstrual hygiene practices, indicating considerable geographical variations in hygienic behaviour among adolescent girls.

The study highlights substantial rural–urban inequalities in menstrual hygiene management among girls in West Bengal. Girls residing in rural and suburban areas continue to experience disadvantages in menstrual health knowledge, attitudes, hygiene practices, and access to health information compared with urban girls. Strengthening school-based menstrual health education, improving water, sanitation and hygiene (WASH) infrastructure, ensuring affordable access to menstrual products, and implementing targeted community-based interventions are essential to reduce these variations and promote equitable menstrual health outcomes.

Keywords: Menstrual hygiene management, Knowledge-Attitude-Practice (KAP), Rural–Urban variations, Indian girls

Introduction

Menstrual hygiene management (MHM) is increasingly recognized as an essential component of adolescent health, gender equality, and public health. The World Health Organization and the United Nations Children's Fund define menstrual hygiene management as the ability of women and girls to use clean menstrual materials, change them in privacy as often as necessary, wash the body with soap and water, and dispose of used menstrual materials safely while having access to adequate sanitation facilities and accurate information (UNICEF & WHO, 2021). Effective menstrual hygiene management is fundamental to safeguarding the physical, psychological, and social well-being of adolescent girls. Nevertheless, millions of girls worldwide continue to face significant challenges in managing menstruation due to inadequate knowledge, poor sanitation infrastructure, limited access to menstrual products, and deeply rooted socio-cultural taboos (Sommer et al., 2015).

Menarche marks an important transition in reproductive life, yet many girls encounter it without adequate preparation or reliable information. In many low- and middle-income countries, menstruation remains surrounded by silence and misconceptions, leading to fear, embarrassment, and unhealthy hygiene practices (Chandra-Mouli & Patel, 2017). Poor menstrual hygiene has been associated with reproductive tract infections, discomfort, school absenteeism, reduced classroom participation, and diminished quality of life (Hennegan et al., 2019). Consequently, improving menstrual health has become an important global public health priority and forms part of the broader agenda to achieve the Sustainable Development Goals related to health, education, gender equality, clean water, and sanitation (United Nations, 2015).

Although awareness regarding menstrual health has improved over the past decade, substantial inequalities remain across different population groups. One of the most persistent variations exists between rural and urban communities. Rural girls often encounter multiple barriers, including limited access to sanitary products, inadequate water, sanitation and hygiene (WASH) facilities, poor availability of reproductive health education, lower educational attainment among parents, and restricted access to healthcare services. Urban girls, in contrast, generally benefit from better educational opportunities, improved health infrastructure, greater availability of menstrual products, and wider exposure to health information through schools and digital media (van Eijk et al., 2016).

Several studies from South Asia have consistently reported marked differences in menstrual hygiene practices according to habitat. A systematic review conducted by van Eijk et al. (2016) demonstrated that urban girls in India were significantly more likely to use hygienic menstrual absorbents than their rural counterparts. Similar variations have been reported in studies from Nepal, Bangladesh, and Pakistan, where inadequate sanitation facilities and socio-economic inequalities continue to influence menstrual hygiene behaviours (Hennegan et al., 2019). These findings indicate that habitat remains an important social determinant of menstrual health.

India presents a particularly important context for understanding rural–urban variations because of its large adolescent population and wide variation in socio-economic development across regions. Over the past decade, the Government of India has introduced several initiatives, including the Menstrual Hygiene Scheme under the National Health Mission, Swachh Bharat Mission, and the *Rashtriya Kishor Swasthya Karyakram* (RKSK), to improve menstrual hygiene awareness and increase access to sanitary products among adolescent girls (Ministry of Health and Family Welfare, 2014). Despite these efforts, evidence from the National Family Health Survey (NFHS-5) indicates that the use of hygienic menstrual protection remains considerably lower among girls residing in rural areas compared with those living in urban

settings. Educational attainment, household wealth, sanitation facilities, and access to information continue to influence menstrual hygiene practices across the country (NFHS-5, 2021).

The rural–urban divide extends beyond the availability of menstrual products. Access to clean water, private toilets, safe disposal facilities, and supportive school environments varies considerably between rural and urban schools. Inadequate school sanitation infrastructure has been identified as an important contributor to menstrual-related absenteeism among girls, particularly in resource-limited settings (Sommer et al., 2015). Girls attending schools without functional toilets, running water, or appropriate disposal facilities often experience anxiety and discomfort during menstruation, which may negatively affect both their educational participation and psychological well-being.

West Bengal represents a unique setting for examining these variations because it encompasses densely populated metropolitan areas, rapidly developing suburban regions, and extensive rural communities. Considerable differences exist across these settings with respect to educational opportunities, household income, healthcare accessibility, sanitation infrastructure, and socio-cultural practices. While previous studies conducted in India have documented menstrual hygiene practices among adolescents, relatively few have comprehensively compared menstrual hygiene knowledge, attitudes, practices, and access to menstrual health resources across urban, suburban, and rural habitats within a large and geographically diverse population. Evidence specific to West Bengal remains particularly limited despite the state's demographic diversity and large adolescent population.

Understanding geographical variations in menstrual hygiene management is essential for designing equitable public health interventions. Interventions that are effective in urban settings may not adequately address the challenges faced by rural girls, where barriers often extend beyond awareness to include affordability, accessibility, infrastructure, and cultural norms. Identifying these differences can help policymakers allocate resources more efficiently, strengthen school health programmes, improve sanitation infrastructure, and develop targeted menstrual health interventions that address the specific needs of different communities.

Against this background, the present study aimed to compare menstrual hygiene knowledge, attitudes, and practices among adolescent girls residing in urban, suburban, and rural areas of West Bengal. In addition, the study examined variations in access to menstrual health resources and evaluated the influence of residential habitat on menstrual hygiene management. By providing evidence from a large school-based sample across thirteen districts, this study seeks to contribute to the growing body of literature on menstrual health inequalities and support the development of context-specific strategies to promote equitable menstrual hygiene management among girls.

Materials and Methods

A school-based comparative cross-sectional study was conducted among school-going girls in West Bengal, India, to examine rural–urban variations in menstrual hygiene management. The study included school-going girls aged 12–18 years who had attained menarche and were enrolled in eighteen government and government-aided secondary and higher secondary schools across thirteen districts of the state.

The sample size was determined using Cochran's formula for cross-sectional studies: $n=Z^2pq/d^2$, where Z=1.96 at a 95% confidence level, p=0.50, q=0.50, and d=0.05. The minimum required sample size was calculated as 384 participants. As the study was conducted across the five administrative divisions of West Bengal, a total of 2,119 girls were included in the study, to ensure adequate regional representation.

A multistage sampling technique was employed. Schools from urban, suburban, and rural areas of the selected districts were included to obtain participants from diverse habitats. Eligible girls were recruited after obtaining permission from the respective school authorities. Data were collected through face-to-face interviews using a pre-tested structured study schedule. The study schedule gathered information on socio-demographic characteristics, menstrual hygiene knowledge, attitudes, practices, menstrual experiences, access to sanitation facilities, and media exposure.

The principal explanatory variable was habitat, categorized as urban, suburban, and rural. The primary outcome variables included menstrual hygiene knowledge, attitudes towards menstruation, and menstrual hygiene practices. Additional variables such as age, family income, mother's education, and media exposure were considered during the analysis.

Data were analysed using IBM SPSS Statistics (Version 26). Descriptive statistics were expressed as frequencies, percentages, means, and standard deviations. Differences in menstrual hygiene knowledge, attitudes, practices, and media exposure across residential habitats were assessed using one-way analysis of variance (ANOVA), followed by post hoc multiple comparison tests. Associations between categorical variables were examined using the Chi-square test with Cramer's V as a measure of effect size. Pearson's correlation analysis and multiple linear regression were performed to identify factors associated with menstrual hygiene management. Statistical significance was established at $p<0.05$.

Ethical approval was obtained from the Institutional Ethics Committee. Permission to conduct the study was obtained from the Govt. of West Bengal and participating schools. Participation was voluntary, and confidentiality and anonymity of the respondents were maintained throughout the study.

Results

A total of 2,119 school-going girls from eighteen schools, six from each habitat, under thirteen districts of West Bengal participated in the study. Participants were categorized according to their habitat as urban, suburban, and rural to examine variations in menstrual hygiene management. Comparative analyses were performed to assess differences in menstrual hygiene knowledge, attitudes, practices, and media exposure across the habitats.

Table 1: Comparison of Mean Scores of Knowledge, Attitude, Practice and Media Exposure across Habitats

Variables	Urban (Mean ± SD)	Suburban (Mean ± SD)	Rural (Mean ± SD)	F
Knowledge Score	4.11 ± 0.40	3.55 ± 0.81	2.48 ± 0.54	1258.73*
Attitude Score	4.37 ± 0.48	4.67 ± 0.46	3.79 ± 0.65	496.67*
Hygiene Practice Score	4.83 ± 0.38	4.21 ± 0.69	3.35 ± 1.03	679.78*
Media Exposure Score	4.75 ± 0.43	4.71 ± 0.45	4.12 ± 0.35	509.25*

*p<0.05

Table 1 shows the comparison of mean knowledge, attitude, hygiene practice, and media exposure scores among girls from urban, suburban, and rural areas. Overall, participants from urban areas scored the highest in knowledge, hygiene practices, and media exposure, while those from suburban areas reported the most positive attitudes toward menstrual hygiene. In contrast, rural participants had the lowest mean scores across all four domains. The observed differences among the three habitat groups were statistically significant for knowledge, attitude, hygiene practices, and media exposure ($p<0.05$).

Table 2: Post Hoc Comparison of Mean Scores Difference across Habitats

Comparison	Knowledge Score	Attitude Score	Practice Score	Media Exposure Score
Urban vs. Suburban	0.56*	-0.31*	0.63*	0.04
Urban vs. Rural	1.63*	0.58*	1.48*	0.64*
Suburban vs. Rural	1.07*	0.89*	0.85*	0.59*

*p<0.05

Table 2 presents the post hoc comparison of mean differences in knowledge, attitude, hygiene practice, and media exposure scores across the three habitat groups. Significant differences were observed between most habitat pairs for knowledge, attitude, and hygiene practice scores (p<0.05). Urban participants had significantly higher knowledge and hygiene practice scores than both suburban and rural participants, while suburban participants also scored significantly higher than their rural counterparts. For media exposure, no significant difference was found between urban and suburban participants, whereas both groups had significantly higher media exposure scores than the rural group.

Table 3: Composite Menstrual Health Indicators by Habitat and Strength of Association

Variable	Dominant Category			χ^2	Cramer's V
	Urban	Suburban	Rural		
Knowledge Level	Good (69.30%)	Moderate (50.74%)	Moderate (57.35%)	449.63*	0.33
Attitude Level	Neutral (74.85%)	Neutral (75.44%)	Neutral (78.53%)	55.81*	0.11
Practice Level	Good (92.25%)	Good (88.93%)	Moderate (91.21%)	1307.61*	0.56
Media Exposure Level	High (75.44%)	High (71.26%)	Moderate (86.31%)	823.54*	0.44

*p<0.05

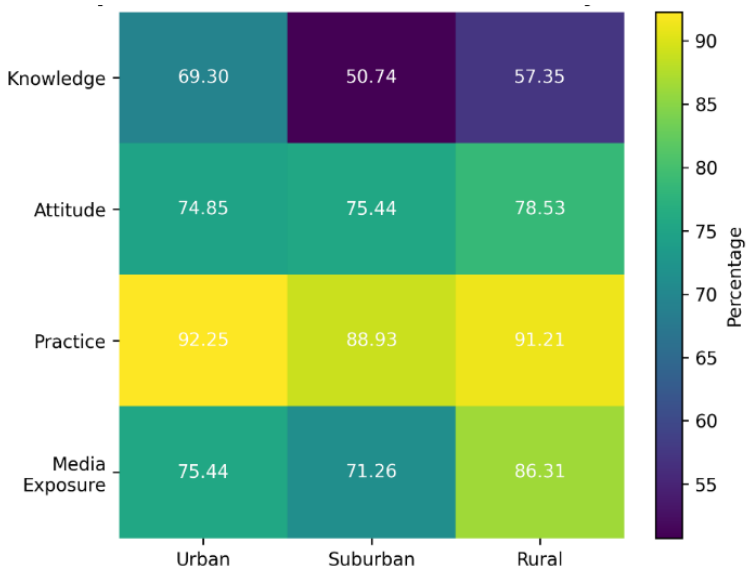

Fig. 1: Heatmap showing Composite Menstrual Health Indicators by Habitat

Table 3 summarises the dominant categories of menstrual health indicators across urban, suburban, and rural habitats, along with the strength of their association. Urban adolescents were predominantly characterised by good knowledge, good hygiene practices, and high media exposure, whereas suburban participants also demonstrated good practices and high media exposure but were mainly classified as having moderate knowledge. In contrast, rural participants were predominantly categorised as having moderate knowledge, moderate hygiene practices, and moderate media exposure. Across all three habitats, the majority of participants exhibited a neutral attitude toward menstrual hygiene. Chi-square analysis showed statistically significant associations between habitat and all four indicators ($p<0.05$). The strength of association was strongest for hygiene practices (Cramer's V=0.56), followed by media exposure (0.44), knowledge (0.33), and attitude (0.11), indicating that habitat had the greatest influence on hygiene practices and media exposure.

Discussion

The present study examined rural–urban variations in menstrual hygiene management among school-going girls in West Bengal and demonstrated significant differences in menstrual hygiene knowledge, attitudes, practices, and media exposure by habitat. Girls residing in urban areas consistently exhibited better menstrual hygiene outcomes than those living in suburban and rural settings. These findings suggest that place of residence remains an important determinant of menstrual health and reflects broader inequalities in education, sanitation infrastructure, access to health information, and socio-economic conditions.

One of the principal findings of this study was the significantly higher level of menstrual hygiene knowledge among urban girls. Girls residing in urban areas achieved better knowledge scores than their suburban and rural counterparts, indicating greater awareness of menstruation, menstrual hygiene practices, and reproductive health. This finding is consistent with previous research from India and other low and middle-income countries, which has shown that urban adolescents generally have greater access to health education, school-based awareness programmes, healthcare services, and reliable sources of reproductive health information (Chandra-Mouli & Patel, 2017; van Eijk et al., 2016). Educational attainment among parents, particularly mothers, and better school resources in urban areas may further contribute to improved menstrual health literacy. In contrast, rural adolescents often rely on informal sources of information, where misconceptions and cultural taboos surrounding menstruation continue to persist.

The present study also identified significant differences in attitudes towards menstruation across residential habitats. Urban participants demonstrated more positive attitudes than girls from suburban and rural areas. Menstrual attitudes are shaped by family beliefs, cultural practices, peer influence, and educational experiences. In many rural communities, menstruation continues to be associated with restrictions on mobility, food consumption, religious participation, and social interaction, reinforcing negative perceptions and feelings of embarrassment (Sommer et al., 2015). The persistence of such socio-cultural norms may explain the comparatively less favourable attitudes observed among rural adolescents in the present study. Similar observations have been reported in qualitative studies conducted in South Asia, where menstrual stigma remains deeply embedded within community practices and gender norms (Hennegan et al., 2019).

A particularly important finding was the substantial disparity in menstrual hygiene practices according to habitat. Urban girls reported significantly better hygiene practices than girls from suburban and rural areas. This finding agrees with the systematic review by van Eijk et al. (2016), which concluded that the use of hygienic menstrual absorbents is considerably higher among urban girls in India than among those living in rural settings. Access to affordable sanitary products, improved water and sanitation facilities, availability of private toilets, and appropriate disposal systems are likely to contribute to these differences. Conversely, rural girls often encounter challenges such as financial constraints, limited availability of menstrual products, inadequate sanitation infrastructure, and insufficient privacy for changing absorbents, all of which negatively influence menstrual hygiene management.

The study further demonstrated significant differences in media exposure among the three residential groups, with urban adolescents reporting greater access to menstrual health information through various communication channels. Although the primary focus of the present study was geographical disparity rather than media exposure itself, the observed differences suggest that unequal access to information may partly explain variations in menstrual knowledge and hygiene practices. Rapid expansion of internet connectivity, digital education, and health communication campaigns has improved access to reproductive health information in urban areas, whereas many rural communities continue to experience limitations in digital infrastructure and health literacy (World Health Organization, 2023). Bridging this information gap is therefore essential for reducing inequalities in menstrual health.

The findings of this study can also be interpreted within the broader framework of the social determinants of health. Habitat is closely associated with education, household income, sanitation facilities, healthcare accessibility, and gender norms, all of which collectively influence menstrual hygiene management. According to the World Health Organization's Commission on Social Determinants of Health, health inequalities arise from differences in the conditions in which people are born, grow, live, study, and work (WHO, 2008). The variations observed in the present study likely reflect these interconnected structural factors rather than residential location alone. Consequently, interventions aimed at improving menstrual hygiene management should address not only awareness but also the broader social and infrastructural barriers faced by rural adolescents.

The results have important implications for public health policy and adolescent health programmes in India. Although national initiatives such as the Menstrual Hygiene Scheme, Rashtriya Kishor Swasthya Karyakram (RKSK), and Swachh Bharat Mission have contributed to improving menstrual health awareness and sanitation, the present findings indicate that geographical inequalities remain substantial (Ministry of Health and Family Welfare, 2014). School-based menstrual health education should be strengthened in rural and suburban areas alongside investments in safe water, sanitation, and hygiene (WASH) infrastructure. Improving access to affordable sanitary products, functional school toilets, disposal facilities, and adolescent-friendly reproductive health services may substantially reduce existing variations. Community-based awareness programmes involving teachers, healthcare workers, and parents may further help challenge persistent menstrual myths and cultural restrictions.

Conclusion

The present study revealed significant rural–urban variations in menstrual hygiene management among girls in West Bengal. Urban adolescents demonstrated better menstrual hygiene knowledge, more positive attitudes, healthier hygiene practices, and greater access to menstrual health information than their suburban and rural counterparts. These findings suggest that habitat remains an important determinant of

menstrual health, reflecting underlying inequalities in education, sanitation infrastructure, healthcare access, and socio-economic conditions.

Addressing these variations requires targeted interventions that strengthen menstrual health education, improve water, sanitation, and hygiene (WASH) facilities in schools, enhance access to affordable menstrual products, and promote community awareness, particularly in rural and underserved areas. Integrating these measures into existing adolescent health and school health programmes can contribute to more equitable menstrual hygiene management and improve the health, educational participation, and overall well-being of menstruating girls. Further longitudinal and community-based studies are recommended to evaluate the long-term effectiveness of interventions aimed at reducing geographical inequalities in menstrual health.

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