Breaking the Silence: Menstrual Hygiene Knowledge and Practices Among Adolescent Girls in Rural Gorkha, Nepal

DOI: https://doi.org/10.3126/tej.v13i1.81667

Govinda Prasad Devkota[1], Sushila Devkota[2], Om Prasad Baral[3]
[1]Mahendra Ratna Campus, Tribhuvan University
devkotagovinda11@gmail.com
ORCID: 0000-0002-9133-7914
[2]Gorkha Campus Gorkha, Tribhuvan University
devkotas045@gmail.com
ORCID: 0009-0002-8870-6245
[3]Mahendra Ratna Campus, Tribhuvan University
ompbaral@gmail.com
ORCID: 0009-0006-1344-1106

Article History

Received	Revised	Accepted
1st January, 2025	2nd February, 2025	2nd March, 2025

Abstract

Objectives: This study assessed the level of knowledge and practice regarding menstrual hygiene among adolescent schoolgirls in Bhimsen Thapa Rural Municipality, Gorkha, Nepal, and examined key factors influencing these outcomes.

Methods: A cross-sectional survey was conducted from May 25 to June 1, 2024, involving 448 adolescent girls. Data were gathered using a structured, self-administered questionnaire and analyzed using IBM SPSS version 25.0. Multivariate binary logistic regression was performed to identify significant predictors, with adjusted odds ratios (AORs) and 95% confidence intervals (CIs) reported.

Results: The analysis revealed that 69% of respondents had good knowledge of menstrual hygiene, but only 28.6% exhibited proper hygiene practices. Alarmingly, just 1.6% disposed of used sanitary pads in appropriate dustbins. Girls aged 17–19 had significantly higher odds of possessing good knowledge [AOR = 7.78; 95% CI: 1.83–32.99], as did those from middle-income families [AOR = 0.51; 95% CI: 0.31–0.85]. Moreover, adolescents whose mothers had attained secondary or higher education were more likely to practice better hygiene [AOR = 1.69; 95% CI: 1.04–2.77].

Conclusions: Despite a moderate level of awareness, hygienic practices among the girls were notably low. This gap highlights the need for targeted interventions to improve menstrual hygiene behaviors. Integrating menstrual health education into the school's

integrated curriculum and conducting parent-focused sessions could foster community-level understanding and support. Promoting awareness and empowering adolescent girls through education and parental involvement are essential to enhancing menstrual hygiene management in rural Nepal.

Keywords: Adolescent girls, knowledge, menstrual hygiene, practices, Nepal

Introduction

Menstruation is a natural physiological process that typically begins during adolescence between the ages of 11 and 15 (Bobel & Kissling, 2011; Itriyeva, 2022). In Nepal, particularly in rural areas, menstruation remains fraught with cultural taboos, social stigma, and misinformation (Baumann et al.,2025; Rothchild & Piya, 2020; Wyckoff, 2024). Poor menstrual hygiene management (MHM) can lead to reproductive tract infections, reduced academic performance, and psychological distress among adolescent girls (Ganguly et al., 2025; Nabwera et al., 2021). The challenges include a lack of awareness, using unhygienic absorbents, inadequate sanitation infrastructure, and economic barriers to obtaining sanitary products.

Adolescent girls often have limited access to accurate information regarding menstruation before menarche, which leads to confusion and distress during their first experience (Niroula et al., 2025; Timsina, 2022). This issue is exacerbated in rural municipalities where health education is scarce, and traditional beliefs hinder open communication about menstruation (Acharya & Khanal, 2025; Bagale & Rijal, 2025). These challenges are particularly pronounced in Bhimsen Thapa RMC, where geographical remoteness and inadequate infrastructure restrict access to proper Water, Sanitation, and Hygiene (WASH) facilities and health education.

Studies conducted in Nepal and other developing countries have revealed that while awareness of menstruation is gradually increasing, the practice of safe menstrual hygiene remains alarmingly low (Devkota & Basyal, 2024; Ghimire et al., 2024; Shrestha et al., 2023; Shrestha et al., 2025; Upadhya & Adhikari, 2023). Many girls improperly dispose of clothes or other unsafe materials, risking infection and environmental harm (Elledge et al., 2018; Kaur et al., 2018; Rheinländer, 2019). Therefore, understanding the knowledge and practices related to menstrual hygiene and the influencing factors is crucial for developing effective interventions for adolescent girls in rural Nepal.

Methods

Study Design and Setting

A cross-sectional study was conducted in Bhimsen Thapa RMC, Gorkha District, Nepal, from May 25 to June 1, 2024. Hilly terrain, dispersed settlements, and limited

health infrastructure characterise the area. The study targeted secondary and higher secondary school girls aged 11 to 19 who had begun menstruating and were present at school during the data collection period.

Sample Size and Sampling Procedures

The sample size was determined using the Raosoft sample size calculator, based on a 95% confidence level, a 5% margin of error, and an expected response distribution of 50%, resulting in a minimum required sample of 384 participants. To compensate for a potential 10% non-response rate, the target sample size was increased to 410. Ultimately, data were collected from 501 adolescent girls. Of these, 448 had reached menarche and were included in the final analysis. A total of 2 schools were selected using purposive sampling based on criteria such as accessibility, student population size, and representation of both public and private institutions. The selection aimed to capture a diverse range of socio-economic and geographic contexts within the study area to enhance the generalizability of the findings.

Since the study was conducted in schools, the sampling frame consisted of the list of adolescent girls enrolled in Grades 6 to 10 across selected schools within the study area. A stratified random sampling method was used to ensure representation from different grades and schools. The sampling frame was obtained in coordination with school administrations, and students were selected proportionately based on enrolment.

Data Collection Tools and Procedures.

A structured, self-administered questionnaire was developed in English, translated into Nepali, and pre-tested among 15 students at Sulikot Rural Municipality Campus to ensure clarity and cultural relevance. The final questionnaire comprised 63 items divided into three sections: demographics, menstrual hygiene knowledge (MHK), and menstrual hygiene practices (MHP). Six trained female data collectors conducted the survey after obtaining informed consent from both school authorities and participants. The data collectors underwent two days of intensive training focused on ethical considerations, survey administration techniques, and effective communication with adolescents. This training helped ensure consistency and accuracy during data collection, thereby enhancing the study's overall validity.

Data Processing and Analysis

Data were analysed using SPSS version 25. Descriptive statistics (frequencies, percentages, means) summarised socio-demographic characteristics and MHKP. Binary logistic regression identified variables significantly associated with good MHK and MHP. Variables with $p \leq 0.20$ in bivariate analysis were entered into multivariate models, and a significance level of $p \leq 0.05$ was used.

Ethical Considerations

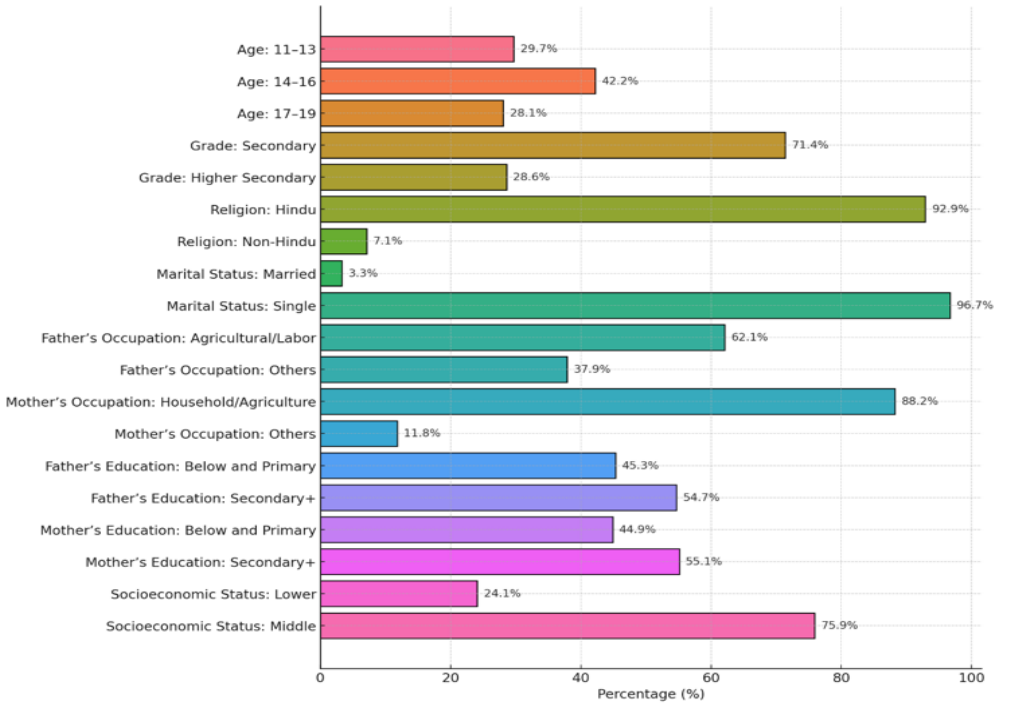
The Tribhuvan University Research Ethics Committee approved the study. Participation was voluntary, and confidentiality was maintained.

Results

The dataset comprises 448 adolescent girls with a mean age of 14.96 years (SD = 2.08), indicating a central concentration in mid-adolescence with moderate age variability. The majority (71.9%) were between the ages of 11 and 16, a critical developmental phase for pubertal changes and reproductive health awareness, with 42.2% aged 14–16, 29.7% aged 11–13, and 28.1% aged 17–19. Educationally, 71.4% of respondents were enrolled in secondary-level education (grades VI–X), while 28.6% were in higher secondary (grades XI–XII), reflecting strong retention in secondary schooling but some attrition at higher levels, potentially due to socio-cultural or economic challenges. Most respondents (92.9%) identified as Hindu, suggesting relative homogeneity in religious and cultural practices that may influence menstrual health behaviours. Marital status data reveal that 96.7% were single and only 3.3% had ever been married, indicating progress in delaying adolescent marriage, possibly due to increased educational access and community-level awareness efforts.

Regarding parental background, 62.1% of fathers were engaged in agriculture or daily wage labour, and 37.9% in business, service, or foreign employment, while 88.2% of mothers were homemakers or agricultural workers, with only 11.8% participating in income-generating activities. Educationally, 54.7% of fathers and 55.1% of mothers had completed secondary education or higher, indicating a relatively favourable literacy environment, although approximately 45% still had only primary or lower educational attainment. Socioeconomic perception revealed that 75.9% of the girls identified their families as middle class. In comparison, 24.1% considered themselves from lower-income households, a critical lens for understanding disparities in access to menstrual hygiene resources, nutrition, and healthcare. These socio-demographic characteristics depict a cohort of adolescent girls from modest, predominantly Hindu households with moderate educational backgrounds and occupational reliance on subsistence work. This context forms a critical foundation for analysing menstrual hygiene knowledge, attitudes, and practices within the community.

Figure 1: Socio-demographic Characteristics of the Respondents (n = 448)



Menstrual Hygiene Knowledge among Adolescent Schoolgirls

The findings from Table 2 indicate a generally high awareness concerning key aspects of menstrual hygiene among the adolescent respondents. A notable 97.5% knew that a more nutritious diet is necessary during menstruation, underscoring a commendable understanding of the connection between nutrition and menstrual health. Additionally, 93.3% of the girls reported knowing how to wear a sanitary pad, and 90.2% understood appropriate disposal methods. These high percentages suggest the successful dissemination of essential hygienic practices, likely attributable to school-based health education or community interventions.

Furthermore, 88.2% acknowledged that menstruation is a natural biological process, reflecting a progressive shift away from stigma and taboo that has traditionally characterised menstrual discourse in many South Asian settings. However, only 72.1% reported having heard about menstruation before menarche, indicating that a substantial proportion (nearly 28%) were likely unprepared for their first menstrual experience, an issue that warrants early and systematic menstrual health education.

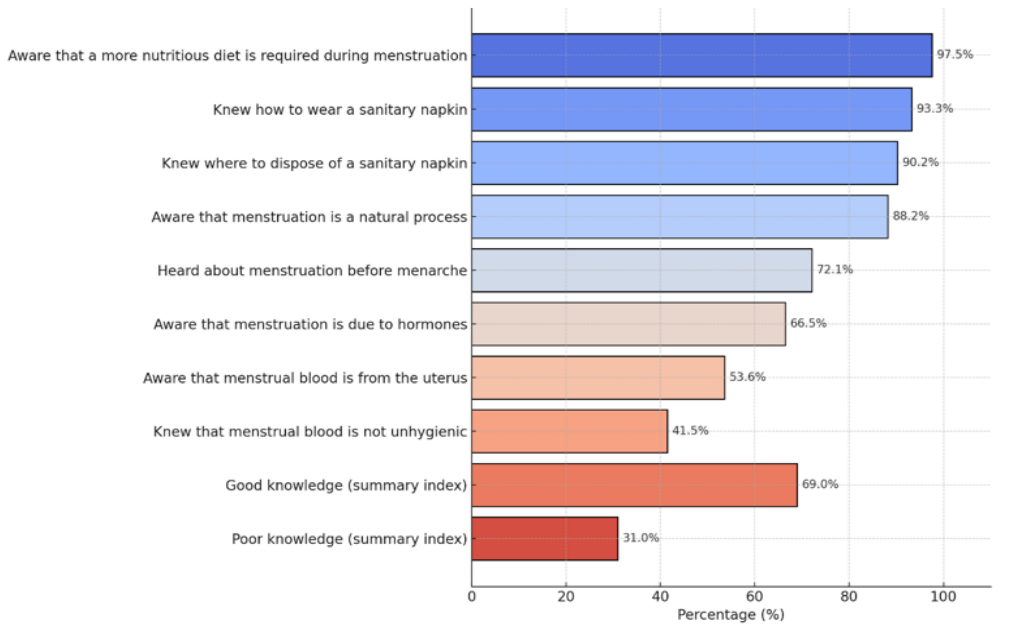
The biological understanding of menstruation seems less robust. While 66.5% were

aware that menstruation is hormonally driven, only 53.6% correctly identified the uterus as the source of menstrual blood, and a notably lower 41.5% recognized that menstrual blood is not unhygienic. This gap indicates lingering misconceptions and cultural misinformation, particularly regarding the impurity and danger associated with menstruation, which may affect self-esteem, health-seeking behaviour, and social participation.

When analysed through a summary index, 69.0% of respondents exhibited good knowledge, while 31.0% displayed poor knowledge. The classification was based on a scoring system in which respondents scoring above the mean value of the total menstrual hygiene knowledge score were categorized as having "good knowledge," while those scoring at or below the mean were considered to have "poor knowledge." This disparity highlights a critical need for comprehensive, age-appropriate menstrual health education integrated within the school curriculum and bolstered through parental and community involvement.

In conclusion, while foundational awareness of menstrual hygiene practices is high, significant gaps remain in biological literacy and pre-menarche preparedness. The findings emphasise the need for holistic educational programmes that go beyond basic hygiene to address deeper cultural, biological, and psychosocial dimensions of menstruation.

Figure 2: Knowledge about Menstrual Hygiene among Adolescent Schoolgirls (n=448)



Menstrual Hygiene Practice

Menstrual Hygiene Practices (MHP) of the respondents. Table 1 presents the findings on MHP among adolescent schoolgirls in Bhimsen Thapa RMC, Gorkha. Only 28.6% of these girls in rural flood-affected regions demonstrated good MHP. More than half of the respondents (55.4% of the schoolgirls) used only sanitary pads as absorbent material, while 44.6% combined sanitary pads with old or new clothes during menstruation. The high cost of sanitary pads (10.9%), mothers suggesting the use of clothes (3.8%), and discomfort when using sanitary pads (3.1%) were the primary reasons for not using them. Additionally, 29.0% of the girls washed their clothes with water and soap, and 30.1% dried them in an open, sunny place. Only 11.0% of the girls changed their sanitary pads or clothes at least three times a day during menstruation, and 1.6% used dustbins to dispose of their sanitary pads. Approximately 51.8% of the females washed their private parts solely with water.

Table 1: Menstrual Hygiene Management Practice among Adolescent Schoolgirls (n = 448)

Practices	Number (%)
Prefers to take a bath every day during menstruation	442 (98.7)
Wash external genitalia during menstruation	427 (95.3)
Uses sanitary napkins as absorbent materials during menstruation	248 (55.4)
Wash external genitalia with water only during menstruation	232 (51.8)
Dry clothes in an open, sunny place	138 (30.1)
Wash clothes with water and soap	130 (29.0)
Changing sanitary napkins or clothes at least three times during menstruation	49 (11.0)
Dispose of used sanitary napkins in a dustbin	7 (1.6)
Good practice	128 (28.6)
Poor practice	320 (71.4)

Discussions

Menstrual Hygiene Knowledge (MHK)

This study examined menstrual hygiene knowledge and practices (MHKP) among adolescent girls attending school in Bhimsen Thapa Rural Municipality, Gorkha. Findings revealed that 69% of participants possessed good knowledge regarding menstruation. This aligns with previous studies from Nepal, Ethiopia, Ghana, and Kenya (Haque, 2014; Kalio, 2023; Kumbeni et al., 2020; Yalew et al., 2021). However, it contrasts with other findings, such as a Nepal-based study reporting that 57.7% of secondary school girls lacked sufficient knowledge, and similar trends were noted in Saudi Arabia (2% had good knowledge) and Bhutan (35.5% understood menstruation

well) (Khanal et al., 2023; Mutairi et al., 2021; Tshomo et al., 2024). These disparities emphasize the need for community awareness, school-based education, and interactive learning to bridge the knowledge gap.

Notably, 72.1% of respondents were aware of menstruation before menarche substantially higher than previous findings from Nepal (36%) and India (42%) (Alam et al., 2017; Ray et al., 2012). Mothers were the most common source of information, followed by siblings, peers, reading materials, and teachers, echoing results from earlier studies (Biruk et al., 2018; Nnennaya et al., 2021; Odey et al., 2022). This likely reflects adolescents' cultural comfort in discussing sensitive topics with female family members.

Approximately 88.2% of girls knew that menstruation is a natural process, although only 66.5% understood its hormonal basis. Similar trends have been documented in Egypt, Nepal, and Nigeria (Adhikari et al., 2007; El-Gilany, 2005; Lawan et al., 2010). Encouragingly, 41.5% of participants did not consider menstrual blood unhygienic, a significant shift compared to only 19.8% in Pakistan (Michael et al., 2020). Misconceptions surrounding menstrual blood contribute to social stigma, reinforcing the need for educational programs that normalize menstruation and eliminate taboos (Olson et al., 2022).

Furthermore, 97.5% of participants recognised the importance of a balanced diet during menstruation, a finding consistent with Michael et al. (2020) and recent studies linking nutrition to hormonal regulation and menstrual health (Cleveland, 2024; Spetz, 2022).

Multivariate analysis highlighted that girls aged 14–16 and 17–19 were significantly more knowledgeable about menstruation than those aged 11–13, consistent with findings from Northeast Ethiopia (Shumie & Mengie, 2022). Additionally, girls from middle-income households showed better MHK than those from lower socioeconomic backgrounds, potentially due to better access to health information and resources. However, this contradicts Mamilla and Goundla’s work, which reported high awareness of menstrual hygiene among low-income girls despite gaps in broader reproductive health knowledge (Itriyeva, 2022).

Table 2: Factors Associated with Menstrual Hygiene Knowledge

Variables	Knowledge Level		Crude OR (95% CI)	P-Value
	Good (%)	Poor (%)		
Age Group (Years)				
11–13	55 (41.4)	78 (58.6)	Reference	
14–16	149 (78.8)	40 (21.2)	5.28 (3.23–8.63)	.000*
17–19	105 (83.3)	21 (16.7)	7.09 (3.96–12.69)	.000*
Academic Grade				
Secondary	203 (63.4)	117 (36.6)	Reference	
Higher Secondary	106 (82.8)	22 (17.2)	0.36 (0.22–0.60)	.000*
Religious Affiliation				
Non-Hindu	19 (59.4)	13 (40.6)	Reference	
Hindu	290 (69.7)	126 (30.3)	1.57 (0.75–3.29)	.226
Marital Status				
Single	298 (68.8)	135 (31.2)	Reference	
Married	11 (73.3)	4 (26.7)	0.80 (0.25–2.57)	.711
Father's Occupation				
Others	116 (68.2)	54 (31.8)	Reference	
Agriculture/Labour	193 (69.4)	85 (30.6)	0.95 (0.63–1.43)	.792
Mother's Occupation				
Others	35 (66.0)	18 (34.0)	Reference	
Household Work	274 (69.4)	121 (30.6)	1.16 (0.63–2.14)	.623
Father's Education Level				
Below Primary	135 (66.5)	68 (33.5)	Reference	
Secondary+	174 (71.0)	71 (29.0)	0.81 (0.54–1.21)	.304
Mother's Education Level				
Below Primary	132 (65.7)	69 (34.3)	Reference	
Secondary+	177 (71.7)	70 (28.3)	0.76 (0.51–1.13)	.173
Perceived Socioeconomic Class				
Lower Class	63 (58.3)	45 (41.7)	Reference	
Middle Class	246 (72.4)	94 (27.6)	0.53 (0.34–0.84)	.006*

*** *P* < 0.05**

The bivariate analysis identified several significant links between socio-demographic variables and menstrual hygiene knowledge among adolescent girls. Age showed a strong association with knowledge level, with girls aged 14–16 years (OR = 5.28; 95%

CI: 3.23–8.63) and 17–19 years (OR = 7.09; 95% CI: 3.96–12.69) being significantly more likely to have good knowledge compared to those aged 11–13. Likewise, students in higher secondary grades were significantly more knowledgeable than those in secondary grades (OR = 0.36; 95% CI: 0.22–0.60). Socioeconomic status also displayed a significant relationship, with girls from middle-class families more likely to possess good knowledge than those from lower-class backgrounds (OR = 0.53; 95% CI: 0.34–0.84). However, no statistically significant associations emerged for religious affiliation, marital status, parental occupation, or parental education levels. These findings indicate that age, academic level, and perceived economic status are key factors influencing menstrual hygiene knowledge among adolescents.

Menstrual Hygiene Practices (MHP)

Despite relatively good knowledge, only 28.6% of the girls practiced proper menstrual hygiene. This is lower than figures reported in Western Ethiopia (39.9%) and Nigeria (88.7%) (Bobel & Kissling, 2011; Upashe et al., 2015). Inadequate MHP can increase vulnerability to infections in the urinary and reproductive tracts (Sumpter, 2013).

The study also found that 55.4% of girls used sanitary pads, which is higher than previous research in Bangladesh (Ha & Alam, 2022; Nnennaya et al., 2021; Rothchild & Piya, 2020). However, 10.9% of respondents reported cost as a barrier. This mirrors findings from Baumann et al. (2025) and Haqu et al. (2014), which highlighted the affordability challenge of sanitary materials for some adolescents.

Only 1.6% of girls used bins to dispose of used menstrual products, far below the 25% observed in rural Bangladesh (Timsina, 2022). Poor disposal practices risk contaminating soil and water, potentially spreading pathogens such as HIV and hepatitis (Niroula et al., 2025). There is a clear need for accessible disposal facilities in schools and communities.

Changing pads fewer than three times daily was common, with only 11% of respondents meeting the recommended frequency. This pattern was consistent with studies by Alam et al. (2017) and Upashe et al. (2015). Although 98.7% bathed daily during menstruation, 51.8% washed only with water, a finding mirrored in Bagale and Rijal's (2025) research. This suggests the importance of improving hygiene education, especially regarding external genital care.

Only 29% of girls washed their reusable pads with soap and water, and 30.1% dried them in open sunlight. These figures are slightly better than those reported in previous studies, which showed many girls dried pads indoors, risking infections due to poor ventilation (Devkota & Basyal, 2024; Das et al., 2015; Kaur et al., 2018).

Multivariate findings indicate that girls aged 14–16 demonstrated significantly better

MHP than their younger peers, likely due to greater exposure to menstrual hygiene education in secondary schools (Haque et al., 2014). In addition, the mother's educational status played a pivotal role. Daughters of mothers with at least secondary-level education were more likely to practice good hygiene, reinforcing the importance of maternal influence and socioeconomic factors (Rheinländer et al., 2019; Timsina, 2022).

Table 3: Predictors of good menstrual hygiene management practice among adolescent schoolgirls

Variables	Practice Level		Crude OR (95% CI)	*P* –Value
	Good (%)	Poor (%)		
Age (Years)				
11–13	30 (22.6)	103 (77.4)	Ref	
14–16	62 (32.8)	127 (67.2)	1.68 (1.01–2.78)	.046*
17–19	36 (28.6)	90 (71.4)	1.37 (0.78–2.41)	.268
Grade				
Higher Secondary	36 (28.1)	92 (71.9)	Ref	
Secondary	92 (28.8	228 (71.3)	1.03 (0.65–1.62)	.895
Religion				
Non-Hindu	117 (28.1)	299 (71.9)	Ref	
Hindu	11 (34.4)	21 (65.6)	0.75 (0.35–1.60)	.452
Marital Status				
Single	123 (28.4)	310 (71.6)	Ref	
Married	5 (33.3)	10 (66.7)	0.79 (0.27–2.37)	.679
Father's occupation				
Others	77 (27.7)	201 (72.3)	Ref	
Agricultural & labor	51 (30.0)	119 (70.0)	1.12 (0.73–1.70)	.601
Mother's occupation				
Others	9 (17.0)	44 (83.0)	Ref	
Household work and Agri.	119 (30.1)	276 (69.9)	2.11 (0.10–4.46)	.051
Father's level of education				
Below and primary	66 (26.9)	179 (73.1)	Ref	
Secondary and above	62 (30.5)	141 (69.5)	1.19 (0.79–1.80)	.401
Mother's level of education				
Below and primary	60 (24.3)	187 (75.7)	Ref	
Secondary and above	68 (33.8)	133 (66.2)	1.59 (1.05–2.41)	.027*

Perceived socioeconomic status				
Lower class	246 (72.4)	94 (27.6)	Ref	
Middle class	63 (58.3)	45 (41.7)	0.84 (0.51–1.37)	.485

*** $P < 0.05$**

Limitations of the Study

While this research provides valuable insights into adolescent schoolgirls' menstrual hygiene knowledge and practices (MHKP) in Bhimsen Thapa Rural Municipality, Gorkha, several limitations must be acknowledged. Firstly, the study cannot establish definitive causal relationships between variables and MHKP outcomes due to its cross-sectional nature. Additionally, the findings are geographically constrained to a single rural municipality, limiting the applicability of the results to adolescent girls in other regions of Nepal.

Variations in cognitive abilities among respondents may have influenced the accuracy and depth of their responses. Furthermore, girls from diverse economic strata, age brackets, and schools may demonstrate differing MHKP levels, particularly as those from economically disadvantaged families might lack adequate access to menstrual hygiene education and sanitary products. Although a pilot study was conducted to tailor the questionnaire to local conditions, a formal validation process within the Nepali context was not undertaken. Future studies would benefit from rigorous psychometric testing of the survey instruments.

Another limitation was the difficulty in securing consent from school authorities and navigating the cultural sensitivity surrounding menstruation during the data collection phase. These challenges may have influenced participation rates and the openness of responses, potentially affecting the completeness of the data.

Conclusion and Recommendations

To conclude, the study found that while a substantial portion (69.0%) of the adolescent girls possessed adequate knowledge about menstrual hygiene, only a minority (28.6%) adhered to appropriate practices. The data also revealed a strong link between MHK and both age and perceived socioeconomic status, especially among schoolgirls from middle-income households. Additionally, maternal education emerged as a key factor in determining whether adolescent girls practiced good menstrual hygiene.

To improve MHP among adolescent girls, it is recommended that community-level educational programs be developed targeting mothers, emphasising hygiene management, effective sanitation practices, and affordable menstrual products. These initiatives could significantly benefit their daughters. The incorporation of menstrual

health education into formal school curricula is also crucial.

Moreover, schools should initiate regular parent-teacher engagement sessions to emphasize menstrual hygiene's importance and create dialogue space. Encouraging open conversations between girls and their mothers and teachers can contribute to a more supportive environment, fostering healthier menstrual hygiene behaviors. These multi-level efforts are necessary to break taboos, promote knowledge, and ensure every girl can manage her menstruation with dignity and safety.

Disclosure statement

No potential conflict of interest was reported by the author.

Ethical statement

Consents were obtained from all the research participants.

Authors' contributions

GPD conceptualised the study, and GPD and SD collected, analysed, interpreted the data and drafted the manuscript. OPB provided scholarly guidance and corrected the manuscript. All the authors read and approved the final version of the manuscript.

Funding

No funding from anywhere.

References

Acharya, P., & Khanal, J. (2015). *Menstruation, myth, and modernity: Understanding traditional and modern influences among Nepalese college girls* [Working paper]. SSRN. https://doi.org/10.2139/ssrn.5170792

Adhikari, P., Kadel, B., Dhungel, S. I., & Mandal, A. (2007). Menstrual hygiene knowledge and behaviors in rural adolescent girls of Nepal. *Kathmandu University Medical Journal, 5*(3), 382–386. https://pubmed.ncbi.nlm.nih.gov/18604059/

Alam, M. U., Luby, S. P., Halder, A. K., Islam, K., Opel, A., Shoab, A. K., et al. (2017). Menstrual hygiene and school absenteeism among Bangladeshi girls: Findings from a cross-sectional study. *BMJ Open, 7*(7), e015508. https://doi.org/10.1136/bmjopen-2016-015508

Bagale, A., & Rijal, A. (2025). Adolescents' understanding of sexual and reproductive health in Nepal. *Modern Issues of Medicine and Management, 29*(1), 1–14. https://orcid.org/0000-0002-5627-9464

Baumann, S. E., Rabin, M. A., Hawk, M., Devkota, B., Upadhaya, K., Shrestha, G. R., et al. (2025). Addressing menstrual seclusion in Nepal through community

knowledge: An anthropological approach. *Culture, Health & Sexuality, 27*(3), 299–320. https://doi.org/10.1080/13691058.2024.2373793

Biruk, E., Tefera, W., Tadesse, N., & Sisay, A. (2018). Analyzing menstrual hygiene practices among adolescent schoolgirls in Ethiopia. *bioRxiv*. https://doi.org/10.1101/450007

Bobel, C., & Kissling, E. A. (2011). Introducing menstruation studies: Cultural portrayals and lived realities. *Women's Studies, 40*(2), 121–126. https://doi.org/10.1080/00497878.2011.537981

Cleveland Clinic. (n.d.). *Irregular periods: Causes and treatments*. https://my.clevelandclinic.org/health/diseases/14633-abnormal-menstruation-periods

Das, P., Baker, K. K., Dutta, A., Swain, T., Sahoo, S., Das, B. S., et al. (2015). Menstrual hygiene and the risk of infections: A study from Odisha, India. *PLOS ONE, 10*(6), e0130777. https://doi.org/10.1371/journal.pone.0130777

Devkota, J., & Basyal, D. K. (2024). School-based interventions in Nepal and their role in social transformation. *International Education Studies, 17*(5), 45–58. https://doi.org/10.5539/ies.v17n5p45

El-Gilany, A. H., Badawi, K., & El-Fedawy, S. (2005). Adolescent menstrual hygiene behaviors in Egypt. *Reproductive Health Matters, 13*(26), 147–152. https://doi.org/10.1016/S0968-8080(05)26210-2

Elledge, M. F., Muralidharan, A., Parker, A., Ravndal, K. T., Siddiqui, M., Toolaram, A. P., & Woodward, K. P. (2018). Managing menstrual waste in low-income countries: A literature review. *International Journal of Environmental Research and Public Health, 15*(11), 2562. https://doi.org/10.3390/ijerph15112562

Ganguly, M., Ganguly, A., Chattaraj, S., & Midya, D. K. (2025). Menstrual health in adolescents: Multi-omics and predictive strategies. *Discover Public Health, 22*(1), 105. https://doi.org/10.1186/s12982-025-00485-x

Ghimire, S., Gahatraj, N. R., Shrestha, N., Manandhar, S., & Dhital, S. R. (2024). Promoting menstrual hygiene through school education in Pokhara, Nepal. *PLOS ONE, 19*(9), e0291884. https://doi.org/10.1371/journal.pone.0291884

Ha, M. A. T., & Alam, M. Z. (2022). Comparing menstrual hygiene practices in urban and rural Bangladesh. *BMC Women's Health, 22*(1), 86. https://doi.org/10.1186/s12905-022-01665-6

Haque, S. E., Rahman, M., Itsuko, K., Mutahara, M., & Sakisaka, K. (2014). School education's impact on menstrual knowledge in Bangladesh. *BMJ Open, 4*(7), e004607. https://doi.org/10.1136/bmjopen-2013-004607

Islam, M. R., Rahman, S. M., Tarafder, C., Rahman, M. M., Rahman, A., & Ekström, E. C. (2020). Nutrition diversity and its social indicators in Bangladeshi adolescents. *Nutrients, 12*(8), 2230. https://doi.org/10.3390/nu12082230

Itriyeva, K. (2022). Overview of the menstrual cycle for adolescents. *Current*

Problems in Pediatric and Adolescent Health Care, 52(5), 101183. https://doi.org/10.1016/j.cppeds.2022.101183

Kabir, B., Barua, K., & Ahmed, M. (2012). BRAC-WASH's school hygiene improvements in Bangladesh. *IRC*. https://www.ircwash.org/resources/improving-menstrual-hygiene-facilities-secondary-schools-initiatives-brac-wash-program

Kalio, M. M. (2023). Adolescent girls' menstrual hygiene knowledge and practices in Kitui, Kenya [Master's thesis, South Eastern Kenya University]. http://repository.seku.ac.ke/xmlui/handle/123456789/7359

Kaur, R., Kaur, K., & Kaur, R. (2018). Global menstrual hygiene challenges and solutions. *Journal of Environmental and Public Health, 2018*, Article ID 1730964. https://doi.org/10.1155/2018/1730964

Khanal, G., Shrestha, N., Adhikari, K., & Ghimire, U. (2023). Menstrual hygiene knowledge among secondary students in Nepal. *BMC Women's Health, 23*, 395. https://doi.org/10.1186/s12905-023-02494-x

Kumbeni, M. T., Otupiri, E., & Ziba, F. A. (2020). Menstrual health in rural Ghanaian schools. *Pan African Medical Journal, 37*, 190. https://doi.org/10.11604/pamj.2020.37.190.22609

Lawan, U. M., Yusuf, N. W., & Musa, A. B. (2010). Menstruation hygiene behavior among Nigerian schoolgirls. *African Journal of Reproductive Health, 14*(3), 201–207.

McCammon, E., Bansal, S., Hebert, L. E., Yan, S., Menendez, A., & Gilliam, M. (2020). Understanding menstrual health barriers for youth in India through a socio-ecological lens. *Sexual and Reproductive Health Matters, 28*(1), 1749342. https://doi.org/10.1080/26410397.2020.1749342

Michael, J., Iqbal, Q., Haider, S., Khalid, A., Haque, N., Ishaq, R., & Khan, M. (2020). Menstrual hygiene knowledge and behaviors among young women visiting a public clinic in Quetta, Pakistan. *BMC Women's Health, 20*(1), 4. https://doi.org/10.1186/s12905-019-0870-3

Mutairi, H., & Jahan, S. (2021). Understanding hygiene practices during menstruation among adolescent girls in Buraidah, Saudi Arabia. *Journal of Family Medicine and Primary Care, 10*(4), 1569–1575. https://doi.org/10.4103/jfmpc.jfmpc_1623_20

Nabwera, H. M., Shah, V., Neville, R., Sosseh, F., Saidykhan, M., Faal, F., et al. (2021). Schoolgirls' menstrual hygiene and health impacts in rural Gambia. *PLOS ONE, 16*(2), e0247554. https://doi.org/10.1371/journal.pone.0247554

Niroula, S., Paudel, S., Chalise, A., Acharya, S., & Marasine, N. R. (2025). Menstruation experiences and its association with psychological distress among school-

going adolescent girls of Nepal: A cross-sectional study. *British Journal of Developmental Psychology*, *43*(1), 161-173. https://doi.org/10.1111/bjdp.12531

Nnennaya, E. U., Atinge, S., Dogara, S. P., & Ubandoma, R. J. (2021). Analyzing menstrual hygiene management among schoolgirls in Nigeria. *African Health Sciences, 21*(2), 842–851. https://doi.org/10.4314/ahs.v21i2.45

Odey, G. O., Adegbite, M. A., Razaqi, N., Faizi, G., Afzali, H., & Ahmadi, M. (2022). Menstrual hygiene knowledge among Afghan schoolgirls: Evidence from Herat. *Razi International Medical Journal, 2*(1), 12–22. https://rimj.org/pubs/index.php/journal/article/view/20

Olson, M. M., Alhelou, N., Kavattur, P. S., Rountree, L., & Winkler, I. T. (2022). The persistent power of stigma: A critical review of policy initiatives to break the menstrual silence and advance menstrual literacy. *PLOS Global Public Health, 2*(7), e0000070. https://doi.org/10.1371/journal.pgph.0000070

Panda, N., Desaraju, S., Panigrahy, R. P., Ghosh, U., Saxena, S., Singh, P., & Panda, B. (2024). Menstrual health and hygiene: Practices and determinants in Odisha, India. *BMC Women's Health, 24*, 144. https://doi.org/10.1186/s12905-024-02894-7

Ray, S., & Dasgupta, A. (2012). Factors shaping menstrual hygiene among adolescent girls: A statistical analysis. *National Journal of Community Medicine, 3*(2), 294–301. https://www.njcmindia.com/index.php/file/article/view/1699

Rheinländer, T., Gyapong, M., Akpakli, D. E., & Konradsen, F. (2019). School girls' narratives on menstruation and sanitation in Ghana. *Health Care for Women International, 40*(1), 13–32. https://doi.org/10.1080/07399332.2018.1444041
Rheinländer, T., Gyapong, M., Akpakli, D. E., & Konradsen, F. (2019). School girls' narratives on menstruation and sanitation in Ghana. *Health Care for Women International, 40*(1), 13–32. https://doi.org/10.1080/07399332.2018.1444041
Shah, V., Nabwera, H. M., Sosseh, F., Jallow, Y., Comma, E., Keita, O., & Torondel, B. (2019). Menstrual hygiene knowledge and beliefs in rural Gambia: A mixed-methods inquiry. *BMC Public Health, 19*, 277. https://doi.org/10.1186/s12889-019-6599-2

Shrestha, A., Bhattarai, T. N., Acharya, G., Timalsina, H., Marks, S. J., Uprety, S., & Paudel, S. R. (2023). Water, sanitation, and hygiene of Nepal: Status, challenges, and opportunities. *ACS ES&T Water*, *3*(6), 1429-1453. https://doi.org/10.1021/acsestwater.2c00303

Shrestha, S., Thapa, S., Bucha, B., Kunwar, S., Subedi, B., Singh, A. R., et al. (2025). MHM training impact among adolescents in Sindhupalchowk. *PLOS ONE, 20*(1), e0313422. https://doi.org/10.1371/journal.pone.0313422

Shumie, Z. S., & Mengie, Z. A. (2022). Determinants of menstrual hygiene in Ethiopian schools. *PLOS ONE, 17*(7), e0271275. https://doi.org/10.1371/journal.

pone.0271275

Spetz, G. (n.d.). Nutritional considerations for a healthy menstrual cycle. Female Health Awareness. Retrieved from https://femalehealthawareness.org/en/nutritional-considerations-for-a-healthy-menstrual-cycle/

Sumpter, C., & Torondel, B. (2013). Menstrual hygiene's impact on health and society: A systematic review. *PLOS ONE, 8*(4), e62004. https://doi.org/10.1371/journal.pone.0062004

Tegegne, T. K., & Sisay, M. M. (2014). Menstrual hygiene management and school attendance in Northeast Ethiopia. *BMC Public Health, 14*, 1118. https://doi.org/10.1186/1471-2458-14-1118

Timsina, S. (2022). Knowledge and Attitude of Menstruation before Menarche among Early Adolescent Girls in Nepal. *Bouddhik Abhiyan (बौद्धिक अभियान)*, 107-114. https://doi.org/10.3126/bdkan.v7i1.47570

Tshomo, T., Gurung, M. S., Shah, S., Gil-Cuesta, J., Maes, P., & Wangdi, R. (2021). Menstrual hygiene management knowledge, attitudes, and practices among female college students in Bhutan. *Frontiers in Reproductive Health, 3*, 703978. https://doi.org/10.3389/frph.2021.703978

Upadhya, S., & Adhikari, A. (2023). Menstruation hygiene practices among girl students in Kathmandu Valley. *Pragyaratna प्रज्ञारत्न, 5*(1), 89-98.

Upashe, S. P., Tekelab, T., & Mekonnen, J. (2015). Menstrual hygiene practices of high school girls in Western Ethiopia. *BMC Women's Health, 15*(1), 84. https://doi.org/10.1186/s12905-015-0245-7

Wyckoff, C. (2024). *An Evaluation of Menstruation Knowledge, Attitudes, Beliefs, and Practices Among Adolescent Girls in Dhulikhel Nepal* (Master's thesis, The Medical College of Wisconsin).

Yalew, M., Adane, B., Arefaynie, M., Kefale, B., Damtie, Y., Mitiku, K., & Tadesse, A. (2021). Knowledge and practice of menstrual hygiene in Ethiopia: A systematic review. *PLOS ONE, 16*(8), e0254092. https://doi.org/10.1371/journal.pone.0254092