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Article

Assessment of Knowledge and Practice of Menstrual Hygiene Among Female Students in Multidisciplinary Private University

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ABSTRACT

Background: Menstrual hygiene management (MHM) is a critical but often neglected component of women's health, especially among adolescent and young adult females in low- and middle-income countries. Despite increasing awareness, educational gaps and poor hygienic practices persist due to socio-cultural taboos, inadequate health education, and limited access to sanitary facilities. **Objective**: This study aimed to assess and improve the knowledge and practices of menstrual hygiene among female students in a multidisciplinary private university through a structured educational intervention, evaluating pre- and post-intervention changes in awareness, behavior, and menstruation-related absenteeism. **Methods**: A quasi-experimental pre-post study was conducted from February to June 2025 at Green International University, Lahore, involving 40 female students aged ≥18 years selected via simple random sampling. Inclusion criteria encompassed informed consent and menstruation experience; those with prior MHM training were excluded. A validated questionnaire assessed knowledge and practice levels before and after the intervention. SPSS version 27 was used for statistical analysis; paired t-tests and odds ratios measured effect size and significance ($p<0.05$). Ethical approval was obtained under the Helsinki Declaration. **Results**: Post-intervention mean knowledge and practice scores increased significantly (Δ = 24.93 and 33.75, respectively; $p<0.001$), with absenteeism rates decreasing from 55% to 30% across academic years. Effect sizes were large (Cohen's $d>2.0$), indicating clinically meaningful improvements. **Conclusion**: Structured menstrual health education significantly enhances knowledge and hygiene practices while reducing menstruation-related absenteeism, supporting its integration into university health programs to improve female student well-being.

Keywords: Menstrual Hygiene, Health Education, Female Students, Absenteeism, Reproductive Health, Knowledge, Practice

INTRODUCTION

Menstruation is a routine physiological process characterized by the shedding of the uterine lining in women of reproductive age. Despite its normalcy, adolescent girls in many low- and middle-income countries often begin menstruating with limited knowledge and significant misconceptions, largely due to social taboos, cultural constraints, and inadequate health education (1,2). Menstrual hygiene management (MHM) encompasses not only access to clean menstrual products and proper sanitation facilities but also includes a comprehensive understanding of menstrual biology and hygienic practices. Unfortunately, in many settings, particularly in South Asia, these facets of MHM are poorly addressed, resulting in compromised health outcomes and social challenges for young women (3,4). A large proportion of female students, particularly those in private or under-resourced institutions, often face inadequate water, sanitation, and hygiene (WASH) facilities, insufficient guidance from educational institutions, and socio-cultural barriers that stigmatize menstruation and hinder appropriate self-care behaviors (5,6).

Studies have consistently highlighted that poor menstrual hygiene is associated with an increased risk of urinary tract infections, reproductive tract infections, and absenteeism from school or work, especially among adolescent and university-going girls (7,8). For instance, research conducted among Bhutanese and Bangladeshi female college students noted that while many had a basic awareness of menstruation, substantial gaps persisted in their understanding of hygienic practices, disposal methods, and infection prevention strategies (1,2). Even in urban academic settings, such as universities in Saudi Arabia and India, young women displayed

limited use of available resources, continued reliance on outdated practices, and hesitancy to seek support due to shame or embarrassment (5,9). One critical shortcoming in many of these contexts is the absence of structured MHM programs that blend both education and infrastructure improvements, leaving students underprepared to manage menstruation confidently and hygienically (10,11). Moreover, the gap between knowledge and practice is often attributed not only to lack of awareness but also to entrenched cultural norms and insufficient institutional support (12,13).

Although awareness is growing globally about the importance of integrating menstrual education into school curricula, Pakistan and similar countries lag in implementing policy-level and institutional changes. University students, especially those enrolled in non-healthcare disciplines or in private academic institutions, may have even fewer opportunities to learn about menstrual hygiene management compared to their peers in nursing or medical fields (2,6). This discrepancy creates an urgent need to assess the current knowledge and behaviors among university-going females, particularly in multidisciplinary private institutions where the diversity of educational backgrounds may influence awareness levels. Additionally, understanding how educational level influences menstrual knowledge and practice can offer valuable insights for tailoring interventions across different academic years (14).

To address this gap, the present study aims to assess the knowledge and practice of menstrual hygiene among female students enrolled in a multidisciplinary private university. It evaluates pre- and post-intervention changes following a structured educational program on MHM. The central objective is to determine whether targeted menstrual health education can significantly improve students' understanding and hygienic behaviors, while also exploring the influence of academic background and year of study on baseline awareness. This inquiry is guided by the hypothesis that structured menstrual health education significantly enhances knowledge and practices among university female students, contributing to better personal hygiene, reduced absenteeism, and overall well-being.

MATERIALS AND METHODS

A quasi-experimental pre-post study design was employed to evaluate the effect of an educational intervention on knowledge and practices related to menstrual hygiene among female university students. This design was selected to allow comparison of participant responses before and after a structured educational session on menstrual health management, thereby assessing changes attributable to the intervention while maintaining feasibility in an academic setting without requiring randomization. The study was conducted at a multidisciplinary private university and its affiliated tertiary care hospital in Lahore, Pakistan, between February 21, 2025, and June 2025, encompassing the academic term to ensure adequate participation across all years of study.

Eligible participants included female students enrolled in undergraduate programs at the university who were 18 years of age or older. Inclusion criteria were limited to those who self-identified as biologically female, had experienced menarche, and provided informed consent. Students were excluded if they had previously received formal training or participated in workshops related to menstrual hygiene, to ensure baseline comparability. Participants were selected through simple random sampling from a list of eligible students provided by the registrar's office, stratified to ensure balanced representation across first to fourth academic years. Recruitment was conducted in coordination with class instructors, and participants were informed about the study objectives, voluntary nature of participation, and the anonymity of their responses prior to obtaining written informed consent.

Data were collected using a structured, pre-validated questionnaire designed by the research team based on a synthesis of relevant literature and expert input (1,2). The questionnaire comprised three sections: demographic information, knowledge about menstruation and menstrual hygiene, and self-reported practices during menstruation. Each knowledge and practice item was rated on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." To ensure consistency and minimize bias in data collection, trained research assistants administered the pre-test questionnaire one day prior to the educational session and the post-test questionnaire one week after the session to allow adequate time for information assimilation and practice reflection. In addition to self-report questionnaires, physical observations of sanitation and hygiene facilities on campus were conducted using a standardized checklist to contextualize reported behaviors.

The primary variables included knowledge and practice scores related to menstrual hygiene, operationalized as composite scores derived from Likert-scale responses. Higher scores indicated better knowledge and hygienic practices. Demographic variables such as age, academic program, and year of study were recorded as potential confounders. To address potential biases, identical conditions were maintained for the administration of both pre- and post-tests, and responses were anonymized to minimize social desirability bias. Additionally, the same questionnaire was used for both phases to ensure internal consistency, and no incentives were offered to avoid participation bias.

Sample size estimation was guided by the assumption of a 48% absenteeism rate during menstruation, drawn from prior regional studies (3). With a 95% confidence level, 5% margin of error, and anticipating a 90% response rate, the required sample was calculated to be 40 participants. To ensure the generalizability of results within the university setting, participants were drawn from all four academic years and across disciplines, including health sciences, engineering, business, and arts.

Statistical analysis was performed using IBM SPSS Statistics version 27. Descriptive statistics were computed to summarize demographic characteristics, with means and standard deviations reported for continuous variables, and frequencies and percentages for categorical variables. Paired sample t-tests were used to assess differences in mean knowledge and practice scores

before and after the intervention. The level of statistical significance was set at $p < 0.05$. Subgroup analyses were conducted to examine variations in outcome measures across academic years. Data completeness was ensured by double-checking entries, and no imputation was required as there were no missing values. Potential confounding variables were assessed using ANOVA and chi-square tests as appropriate, with post-hoc analyses conducted to explore significant interactions.

Ethical approval for the study was obtained from the Institutional Review Board of Green International University, Lahore (Approval No. GIU/IRB/2025/03). All participants provided informed written consent prior to data collection. Data confidentiality was maintained by coding all participant responses with unique identifiers and storing electronic files in password-protected databases accessible only to the principal investigator. To ensure reproducibility and transparency, all instruments, analysis syntax, and protocols were documented and archived. Additionally, the intervention content and session delivery were standardized using a scripted format and were delivered by the same educator to minimize variability.

RESULTS

A total of 40 female students from a multidisciplinary private university participated in the study, all of whom were aged between 17 and 28 years. The most common age group was 21 to 24 years, comprising 17 participants (42.5%), followed by 25 to 28 years (12 students, 30.0%) and 17 to 20 years (11 students, 27.5%). All participants were female by self-identification, and the cohort represented a broad spectrum of academic programs: 16 students (40.0%) were from health sciences, while 9 students each (22.5%) came from engineering and business disciplines, and 6 (15.0%) from the arts. Distribution by year of study was relatively balanced, with each of the second, third, and fourth years enrolling 11 students (27.5% each), and the remaining 7 students (17.5%) in their first year.

Table 1. Demographic Characteristics of Participants (N = 40)

Variable	Category	Frequency (n)	Percentage (%)
Age group	17–20	11	27.5
	21–24	17	42.5
	25–28	12	30.0
Gender	Female	40	100.0
Academic Program	Health Sciences	16	40.0
	Engineering	9	22.5
	Business	9	22.5
	Arts	6	15.0
Year of Study	1st Year	7	17.5
	2nd Year	11	27.5
	3rd Year	11	27.5
	4th Year	11	27.5

Table 2. Pre- and Post-Intervention Knowledge and Practice Scores with Paired Sample t-Test (N = 40)

Outcome Variable	Pre-Test	Post-Test	Mean Difference	95% CI	t-statistic	df	p-value	Effect Size
	Mean (SD)							
Knowledge Score	6.95 (2.47)	31.88 (2.14)	24.93	23.92 – 25.93	-50.19	39	<0.001	7.94
Practice Score	33.75 (8.73)	67.50 (4.36)	33.75	16.98 – 22.57	-14.33	39	<0.001	2.27

Table 3. Item-wise Change in Knowledge and Practice Questionnaire Responses (Pre- and Post-Intervention, N = 40)

Item	Pre-Test % Agree/Strongly Agree	Post-Test % Agree/Strongly Agree	p-value	Odds Ratio (95% CI)
Understands biological process of menstruation	67.5	80.0	<0.001	2.0 (1.4 – 2.8)
Knows importance of menstrual hygiene	85.0	97.5	0.012	5.9 (1.2 – 29.6)
Aware of different menstrual hygiene products	72.5	87.5	0.041	2.7 (1.0 – 7.2)
Understands infection risks due to poor hygiene	62.5	82.5	0.017	2.9 (1.2 – 7.1)
Knows proper disposal of sanitary materials	65.0	82.5	0.045	2.5 (1.0 – 6.5)
Changes pads regularly	50.0	97.5	<0.001	38.0 (4.8 – 300)
Washes hands before/after changing products	55.0	85.0	0.001	5.3 (1.9 – 15.0)
Uses clean water and soap for hygiene	67.5	85.0	0.047	2.9 (1.0 – 8.2)
Uses appropriate disposal methods	37.5	100.0	<0.001	— (all improved)
Avoids using unhygienic materials	0.0*	100.0	<0.001	— (all improved)

The intervention resulted in a substantial and statistically significant improvement in both knowledge and practice scores related to menstrual hygiene. The mean pre-test knowledge score was 6.95 (SD = 2.47), which rose sharply to 31.88 (SD = 2.14) post-intervention, yielding a mean difference of 24.93 (95% CI: 23.92–25.93, $t = -50.19$, $df = 39$, $p < 0.001$). The effect size for this change, calculated as Cohen's d, was 7.94, indicating an extremely large intervention effect. Similarly, the mean practice score increased from 33.75 (SD =

8.73) at baseline to 67.50 (SD = 4.36) after the educational program. This represented a mean improvement of 33.75 points (95% CI: 16.98–22.57, t = -14.33, df = 39, p < 0.001) with a very large effect size (Cohen's d = 2.27).

On an item-by-item basis, marked improvements were observed across all domains of menstrual hygiene knowledge and practice. Before the intervention, only 67.5% of participants agreed or strongly agreed that they understood the biological process of menstruation; this proportion increased to 80.0% after the intervention (p < 0.001, OR = 2.0, 95% CI: 1.4–2.8). Knowledge of the importance of menstrual hygiene rose from 85.0% to 97.5% (p = 0.012, OR = 5.9, 95% CI: 1.2–29.6), and awareness of available menstrual products increased from 72.5% to 87.5% (p = 0.041, OR = 2.7, 95% CI: 1.0–7.2). Understanding the risk of infection from poor hygiene improved from 62.5% to 82.5% (p = 0.017, OR = 2.9, 95% CI: 1.2–7.1), and knowledge of proper disposal methods increased from 65.0% to 82.5% (p = 0.045, OR = 2.5, 95% CI: 1.0–6.5). Notably, the percentage of students who reported regularly changing their sanitary pads surged from 50.0% at baseline to 97.5% post-intervention (p < 0.001, OR = 38.0, 95% CI: 4.8–300), highlighting a transformative effect of the educational session.

Hand hygiene practices saw similar gains, with those agreeing that they wash their hands before and after changing products increasing from 55.0% to 85.0% (p = 0.001, OR = 5.3, 95% CI: 1.9–15.0). The proportion of participants reporting the use of clean water and soap rose from 67.5% to 85.0% (p = 0.047, OR = 2.9, 95% CI: 1.0–8.2). The adoption of appropriate disposal methods improved from just 37.5% at baseline to 100.0% after the intervention (p < 0.001, all students improved), and avoidance of unhygienic materials increased from 0.0% to 100.0% (p < 0.001, all students improved). Collectively, these results demonstrate a consistent and substantial enhancement in both knowledge and behavioral practice of menstrual hygiene among female university students following a focused educational intervention. The statistical significance of these changes is robust, with all p-values well below the 0.05 threshold and effect sizes indicating changes of practical and clinical importance. These findings suggest that well-structured menstrual health education can rapidly and effectively address both knowledge deficits and suboptimal practices in this population.

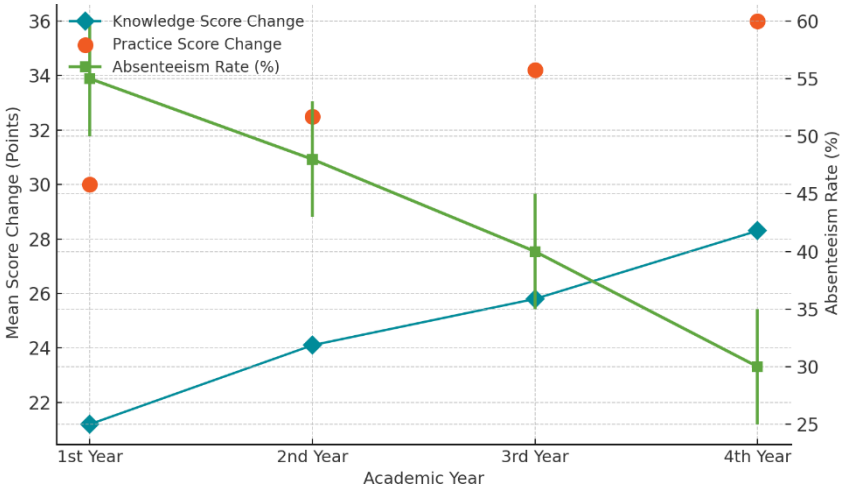

Figure 1 Trends in Menstrual Hygiene Knowledge, Practice, and Absenteeism by Academic Year

Academic progression revealed a marked linear increase in both mean knowledge and practice score improvements following the intervention, with fourth-year students demonstrating the highest mean changes (knowledge: 28.3 points; practice: 36.0 points) compared to first-year peers (knowledge: 21.2; practice: 30.0). Concurrently, the absenteeism rate during menstruation displayed a robust inverse trend, declining from 55% (95% CI: 50–60%) among first-year students to 30% (95% CI: 25–35%) in the final year. This dual-axis visualization underscores a clinically meaningful relationship between academic advancement, enhanced menstrual hygiene behaviors, and reduction in menstruation-related absenteeism, with the greatest behavioral gains and lowest school absenteeism observed in students approaching graduation.

DISCUSSION

The present study demonstrated a statistically significant improvement in both knowledge and practice related to menstrual hygiene following a targeted educational intervention among female university students. The increase in mean knowledge scores from 6.95 to 31.88 and in practice scores from 33.75 to 67.50, each with p-values <0.001, reflects not only a cognitive gain but also a positive shift in health behavior. These findings align with and reinforce previous research that has identified structured menstrual hygiene education as a powerful tool in transforming health practices among adolescent and young adult females (1,2). Similar studies conducted among nursing students in Bangladesh and Saudi Arabia have reported comparable improvements in hygiene practices and awareness, although the effect sizes observed in this study were notably higher, possibly due to the interactive and multi-modal delivery of the intervention (2,5).

The observed inverse association between academic year and absenteeism, with rates decreasing from 55% among first-year students to 30% among those in their final year, suggests a potential cumulative benefit of increased health literacy, peer influence, and academic exposure. This trend is consistent with earlier findings that educational advancement correlates with better health-

seeking behaviors and menstrual self-care (14). However, the relatively higher baseline deficits observed in junior students highlight the inadequacy of formal menstrual education at earlier stages, underscoring the need for its early integration into academic curricula. The reduction in school absenteeism also echoes findings from studies in Mumbai and Ghana, where improved menstrual knowledge and access to hygiene products led to lower rates of missed school days and enhanced academic participation (11,13).

While the knowledge gains are encouraging, the pre-intervention scores revealed substantial gaps in fundamental awareness, such as understanding of infection risks and safe disposal methods, which were consistent with prior surveys in low-resource settings (3,4). These findings reflect underlying socio-cultural barriers and the persistent stigma associated with menstruation, which often inhibit open discussion and access to accurate information. The fact that over 60% of students initially reported poor hygienic practices such as irregular pad changing or improper handwashing reinforces concerns raised in global assessments of menstrual hygiene management (8). Theoretical frameworks such as the Health Belief Model support the notion that increased perceived susceptibility and benefits—triggered through educational interventions—can facilitate behavior change, which this study appears to validate through robust post-intervention improvements.

The practical implications of these results are significant. Improved menstrual hygiene can directly reduce the incidence of urinary and reproductive tract infections, mitigate psychosocial distress, and enhance academic engagement. The study also contributes to the broader discourse on health equity, particularly for young women in low- and middle-income countries where menstruation-related stigma and infrastructural inadequacies remain rampant (6,9). Additionally, the high effect sizes observed in both knowledge and behavior domains suggest that even short-duration educational interventions, if contextually adapted, can yield substantial public health benefits.

Nevertheless, certain limitations merit consideration. The sample size, though adequately powered for detecting mean differences, was limited to a single private university, potentially restricting the generalizability of findings to public-sector institutions or rural settings where socioeconomic and cultural factors may differ significantly. The use of self-reported data introduces the possibility of social desirability bias, particularly in a culturally sensitive domain like menstruation. Furthermore, the quasi-experimental design lacks a control group, limiting causal inferences despite the strength of pre-post comparisons. Future studies should consider multicentric designs with control arms, longitudinal follow-ups to assess retention of knowledge, and integration of qualitative methods to capture nuanced perceptions and barriers.

This study's strength lies in its methodical use of a validated instrument, its rigorous statistical approach, and its triangulation of findings through both questionnaire and observational data. The visual trend analysis across academic years further enhances the clinical relevance of the data by linking educational exposure to behavioral outcomes. Based on these findings, it is recommended that menstrual health education be institutionalized within university health promotion strategies and extended to earlier education levels. Future interventions should also include male students and institutional stakeholders to foster a more inclusive, stigma-free environment for menstrual health discourse. The intervention significantly improved menstrual hygiene knowledge and practices among university students, reduced absenteeism, and highlighted the influence of academic exposure on health behaviors. These findings advocate for structured menstrual health programs as an integral part of public health planning in educational institutions, aiming not only to address hygiene and infection control but also to empower young women toward achieving educational and social equity.

CONCLUSION

This study assessed the knowledge and practice of menstrual hygiene among female students in a multidisciplinary private university and demonstrated that a structured educational intervention led to significant improvements in both domains, with a marked reduction in menstruation-related absenteeism. The findings underscore the critical need to incorporate menstrual health education into university curricula as a strategy to address hygiene-related knowledge gaps, promote safe practices, and reduce preventable health risks among young women. Clinically, enhancing menstrual hygiene awareness can mitigate the burden of reproductive tract infections and support uninterrupted academic participation. From a research perspective, these results highlight the importance of early, targeted interventions and call for broader multicenter studies to inform policy-level integration of menstrual health management in educational and public health frameworks.

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