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RESEARCH ARTICLE

Knowledge, Information, and WASH Utilization Factors Associated with Menstrual Hygiene Practices Among Adolescent Girls

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ABSTRACT

Introduction: Menstrual hygiene practices are shaped by personal knowledge, information support, and the school water, sanitation, and hygiene (WASH) environment. Evidence from Indonesian junior high schools remains limited on how knowledge, specific information sources, and the distinction between WASH availability and actual use are associated with practice.

Methods: This analytic cross-sectional study examined bivariate associations between knowledge, five information sources, WASH availability, WASH utilisation, and menstrual hygiene practices among 246 menstruating eighth-grade girls from two public junior high schools in the Kasemen Community Health Center area in 2023. All eligible students were included. Data were collected using a self-administered questionnaire completed by each student. Associations were tested using Yates-corrected chi-square or Fisher's exact tests, and unadjusted odds ratios (ORs) with 95% confidence intervals (CIs) were reported.

Results: Poor menstrual hygiene practices were reported by 217 students (88.2%), low knowledge by 191 (77.6%), self-reported WASH availability categorised as not available for 207 students (84.1%), and WASH nonuse by 167 (67.9%). Poor practice was associated with low knowledge (OR = 2.856; 95% CI: 1.270–6.426; p = 0.017), never receiving information from health workers (OR = 2.951; 95% CI: 1.309–6.651; p = 0.013), and WASH nonuse (OR = 2.561; 95% CI: 1.169–5.614; p = 0.028). Information from family, teachers, peers, or media and self-reported core WASH availability were not statistically associated with practice.

Conclusion: In these unadjusted bivariate analyses, knowledge, information from health workers, and WASH utilisation were associated with menstrual hygiene practices, whereas self-reported core WASH availability was not. The findings support evaluating school-based menstrual health education and interventions that facilitate appropriate WASH use; longitudinal or intervention studies are needed to determine their effects.

Keywords: Menstrual Hygiene Practices; Knowledge; Information Sources; WASH; Adolescent Girls

INTRODUCTION

Menstruation is a normal physiological process associated with reproductive maturation in adolescent girls. This biological cycle is still considered taboo in many developing countries and even carries a social stigma for some groups. This may affect adolescent girls' preparedness for menstruation. A lack of preparedness for menstruation may affect adolescents' psychological (1,2), social, and educational well-being (3) and reproductive health practices (4). Menstrual hygiene practices are an important component of personal hygiene and play an important role in reproductive health (5). Appropriate menstrual hygiene practices are important for maintaining genital health and minimising hygiene-related discomfort and potential reproductive health problems (6). A hospital-based cross-sectional study among women aged 18–45 years in Odisha, India, found that less frequent personal washing during menstruation was associated with a higher prevalence of bacterial vaginosis and Candida infection (7). Previous studies have examined the relationship between menstrual hygiene practices and vulvar itching (pruritus vulvae) among adolescent girls (8,9).

A PRECEDE–PROCEED perspective provides a framework for the variables examined in this study. An Indonesian study has also examined factors related to reproductive health among junior high school adolescents (10). Knowledge represents a predisposing factor that may shape motivation and skills; information from family, teachers, peers, health workers, and media represents reinforcing influences that can differ in credibility, frequency, message content, and social support; and school WASH infrastructure represents an enabling condition for menstrual hygiene practices (11,12). Within this framework, availability describes whether selected facilities are present, whereas utilisation reflects students' reported use of those facilities.

Facility availability does not necessarily result in utilisation. Students' decisions to use school WASH facilities may also depend on accessibility, privacy, cleanliness, safety, acceptability, reliable water, soap, and appropriate disposal options (13–17). The questionnaire recorded several of these characteristics, but the binary WASH availability variable used in the analysis was constructed from four core facilities; therefore, availability and utilisation were analysed as related but distinct indicators, and differences between them were interpreted cautiously.

Kasemen District in Serang City has four public junior high schools serving 1,545 students. Although the practical need for menstrual hygiene support is well established, few Indonesian junior high school studies have jointly examined knowledge, specific information sources, and both the availability and actual utilisation of school WASH facilities. The present study addressed this gap by assessing the bivariate associations of menstrual hygiene practices with knowledge, ever having received information from family, teachers, peers, health workers, or media, and the availability and utilisation of WASH facilities among adolescent girls at public junior high schools in the Kasemen Community Health Center area.

METHODS

Study Design

This study used an analytic cross-sectional design to assess associations among knowledge, sources of information, WASH availability, WASH utilisation, and menstrual hygiene practices at one point in time. The design estimates contemporaneous associations and does not establish temporal order or causality.

Participants and Sample

The source population comprised all 262 eighth-grade girls enrolled in two public junior high schools in the Kasemen Community Health Center area: 37 students at SMP Negeri 26 Kota Serang and 225 students at SMP Negeri 5 Kota Serang. Eligibility required enrolment in the eighth grade and having experienced menarche. Sixteen students had not yet experienced menarche and were excluded from the study: 2 students from SMP Negeri 26 Kota Serang and 14 students from SMP Negeri 5 Kota Serang. Thus, 246 students met the eligibility criteria and participated: 35 students from SMP Negeri 26 Kota Serang (14.2%) and 211 students from SMP Negeri 5 Kota Serang (85.8%). The study used total-population sampling by including all eligible students. Respondent counts by school could be identified from the study sample-unit distribution records. However, the WASH availability category frequencies of 207 and 39 did not match the respondent counts by school of 35 and 211 and therefore could not be directly interpreted as representing the distribution of respondents by school.

Setting and Study Period

The study was conducted in 2023 at two public junior high schools located within the working area of the Kasemen Community Health Center, Serang City, Banten Province, Indonesia. Participant recruitment and questionnaire-based data collection were conducted following the issuance of ethical approval on 3 July 2023.

Variables and Measurement Instruments

The questionnaire used in this study had been adapted and shortened from a prior instrument. The retained study documentation includes the administered questionnaire and operational definitions, but it does not permit reliable reconstruction of which source items or domains were retained, removed, or modified during adaptation and shortening. Consequently, the construct validity of the shortened version cannot be re-verified from the retained documentation. The available questionnaire contained 10 menstrual hygiene practice items, 15 knowledge questions, five information-source items, five WASH utilisation items, and 14 WASH availability items. Menstrual hygiene practice was measured using 10 dichotomous items, scored 1 for a response consistent with the study scoring key and 0 for other responses (possible score:

0–10). Knowledge was assessed using 15 single-choice questions; correct answers were scored 1 and incorrect answers 0 (possible score: 0–15). The original operational definitions identify median values of 4 for menstrual hygiene practice and 6 for knowledge as the categorisation thresholds. However, the retained records do not preserve individual continuous scores or the original recoding syntax and do not explicitly document how scores exactly equal to these medians were classified. The retained analytic tables consistently report 217 participants in the poor-practice category and 29 in the good-practice category, and 191 in the low-knowledge category and 55 in the high-knowledge category; these original analytic classifications and counts were therefore retained rather than recalculated. They are treated as study-specific operational categories rather than externally validated classifications or prevalence thresholds. Information exposure was recorded separately for family, teachers, peers, health workers, and media as "ever" or "never"; "ever" meant any prior receipt of menstrual information and did not measure frequency, quality, content, credibility, or social support. WASH utilisation was assessed using five yes/no items, each scored 1 for "yes" and 0 for "no" (possible score: 0–5). The items covered use of the school bathroom, changing sanitary pads in the school bathroom, use of sanitary pads provided by the school, washing sanitary pads, and disposing of them in the bathroom waste bin. In the reported categorisation, at least four "yes" responses were categorised as utilising WASH facilities; a value of 1 referred to each item score, not the category threshold. WASH availability was self-reported by each student through 14 yes/no questionnaire items. In the original operational definition, these 14 items comprised four core facilities—adequate clean water (D1), a water-seal latrine (D2), a waste bin (D6), and a septic tank (D14)—plus 10 additional facilities (D3-D5 and D7-D13): soap, tissue, spare sanitary pads, a mirror, menstrual information materials, adequate lighting, a non-flooded floor, a roof/ceiling, a lockable door, and a clothes hook. The binary WASH availability variable used in the bivariate analysis was constructed from the four core facilities only: WASH was categorised as available when all four core facilities were reported present and not available when the four core facilities were not complete. The 10 additional items were recorded separately and were not used to construct the binary availability variable. Because the responses were provided by each student, the unit of measurement for WASH availability was the individual respondent.

Data Collection and Quality Control

Data collection was conducted during school hours over one week in a designated private room. After consent procedures, the research team distributed the questionnaire, explained standardised completion instructions, and remained available only to clarify the instructions. Students completed the questionnaire independently; teachers and other school staff were not present during completion, while the students remained under the supervision of the research team. Completed questionnaires were returned directly to the research team, and responses were handled confidentially.

Statistical Analysis

Univariate results are presented as frequencies and percentages. Bivariate associations were assessed in 2 × 2 tables using the Yates-corrected Pearson chi-square test. Fisher's exact test was used when sparse cells made the chi-square approximation unsuitable (information from family and WASH availability). Statistical significance was set at $p < 0.05$. Unadjusted odds ratios for poor versus good menstrual hygiene practice and 95% confidence intervals are reported; the second category in each comparison is the reference. Multivariable modelling was not performed because only 29 respondents had good practice and the retained dataset lacked several potential confounders. School-level clustering was not modelled because school identifiers were not retained. All reported analyses contained 246 observations for the variables included in the corresponding 2 × 2 tables; therefore, no missing observations were present for those analysed variables. Statistical analyses were performed using IBM SPSS Statistics, version 29.

Ethical Considerations

Ethical approval was granted by the Research Ethics Committee of Faletehan University on 3 July 2023 (Approval No. 412/KEPK.UF/VII/2023), prior to participant recruitment and data collection. Because participants were minors, written permission from a parent or guardian and written assent from each adolescent were obtained before participation. Participation was voluntary, students could decline or stop without consequence, questionnaires were completed privately without teachers present, and study records were handled confidentially.

RESULTS

The distributions of menstrual hygiene practices, knowledge, information sources, WASH availability, and WASH utilisation among the 246 respondents are presented in Table 1.

Table 1. Menstrual Hygiene Practices, Knowledge, Information Sources, WASH Availability, and WASH Utilisation

Variables	F	%
Menstrual Hygiene Practices		
Poor	217	88.2%
Good	29	11.8%
Level of Knowledge		
Low	191	77.6%
High	55	22.4%
Sources of Information		
a. Family		
Never	6	2.4%
Ever	240	97.6%

b. Teacher		
Never	104	42.3%
Ever	142	57.7%
c. Peers		
Never	111	45.1%
Ever	135	54.9%
d. Health workers		
Never	142	57.7%
Ever	104	42.3%
e. Media		
Never	164	66.7%
Ever	82	33.3%
Availability of WASH Facilities		
Not available	207	84.1%
Available	39	15.9%
Utilisation of WASH Facilities		
No	167	67.9%
Yes	79	32.1%

Of 246 respondents, 217 (88.2%) were categorised as having poor menstrual hygiene practices and 191 (77.6%) as having low knowledge. Most had ever received menstrual information from family (240; 97.6%) and teachers (142; 57.7%), while 104 (42.3%) had ever received information from health workers. The self-reported WASH availability measure, based on the completeness of the four core facilities, was categorised as not available for 207 students (84.1%) and available for 39 (15.9%); 167 students (67.9%) reported not using WASH facilities.

Table 2. Bivariate Associations with Menstrual Hygiene Practices Among Public Junior High School Students

No	Variables	Menstrual Hygiene Practices						*P value*	OR (95% CI)
		Poor		Good		Total			
		N	%	N	%	N	%		
1.	**Level of knowledge**								
	Low	174	91.1%	17	8.9%	191	100%	0.017*	2.856 (1.270–6.426)
	High	43	78.2%	12	21.8%	55	100%		
2.	**Sources of information:**								
	a. Family								
	Never	5	83.3%	1	16.7%	6	100%	0.533	0.660 (0.074–5.859)
	Ever	212	88.3%	28	11.7%	240	100%		
	b. Teacher								
	Never	94	90.4%	10	9.6%	104	100%	0.481	1.452 (0.645–3.269)
	Ever	123	86.6%	19	13.4%	142	100%		
	c. Peers								
	Never	99	89.2%	12	10.8%	111	100%	0.816	1.189 (0.542–2.608)
	Ever	118	87.4%	17	12.6%	135	100%		
	d. Health workers								
	Never	132	93.0%	10	7.0%	142	100%	0.013*	2.951 (1.309–6.651)
	Ever	85	81.7%	19	18.3%	104	100%		
	e. Media								
	Never	143	87.2%	21	12.8%	164	100%	0.625	0.736 (0.311–1.742)
	Ever	74	90.2%	8	9.8%	82	100%		
3.	**Utilisation of WASH facilities**								
	No	153	91.6%	14	8.4%	167	100%	0.028*	2.561 (1.169–5.614)
	Yes	64	81.0%	15	19.0%	79	100%		
4.	**Availability of WASH facilities**								
	Not available	181	87.4%	26	12.6%	207	100%	0.588	0.580 (0.167–2.020)
	Available	36	92.3%	3	7.7%	39	100%		

*p < 0.05. ORs are unadjusted odds of poor practice for the first category versus the second (reference) category; 95% CIs are shown. Yates-corrected Pearson chi-square tests were used except for information from family and WASH availability, which used Fisher's exact tests because of sparse cells. "Ever" denotes any prior receipt of information.

In unadjusted bivariate analyses, low knowledge was associated with higher odds of poor menstrual hygiene practice than high knowledge (OR = 2.856; 95% CI: 1.270–6.426; p = 0.017). Never receiving information from health workers was associated with higher odds of poor practice than ever receiving such information (OR = 2.951; 95% CI: 1.309–6.651; p = 0.013), and WASH nonuse was associated with higher odds of poor practice than use (OR = 2.561; 95% CI: 1.169–5.614; p = 0.028). Information from family, teachers, peers, or media and self-reported core WASH availability were not statistically associated with practice.

DISCUSSION

Principal Findings

Among the 246 respondents, 217 (88.2%) were categorised as having poor menstrual hygiene practices. At the item level, the most common poor menstrual hygiene behaviour was not changing sanitary pads while at school, reported by 224 respondents (91.1%). This was followed by not changing pads every four hours (223; 90.7%), not using sweat-absorbing underwear (214; 87.0%), not changing underwear twice a day (207; 84.1%), not cleaning the genital area from front to back (195; 79.3%), not drying the genital area after cleaning (181; 73.6%), and not washing hands before and after changing pads (165; 67.1%). In addition, 118 respondents (48.0%) did not use clean water alone to clean the genital area. The least frequently reported behaviours classified as poor in the original study coding were not wrapping used pads before disposal (26; 10.6%) and not washing pads after use (27; 11.0%). The questionnaire did not explicitly distinguish disposable from reusable sanitary pads; therefore, the latter item should be interpreted cautiously, and the appropriateness of washing used pads cannot be determined from the available documentation.

Low knowledge was associated with higher unadjusted odds of poor practice. This finding is consistent with the view that knowledge can function as a predisposing factor by supporting informed decisions about menstrual care. However, the cross-sectional bivariate result does not demonstrate that low knowledge caused poor practice or that the association is independent of school, household, socioeconomic, or other individual factors.

Among the five measured information sources, only never receiving information from health workers was statistically associated with poor practice. Health workers may deliver more standardised and technically accurate messages than some informal sources, but credibility, frequency, content, comprehension, and social support were not measured; this explanation is therefore a literature-informed interpretation rather than a direct finding. The null results for family and teachers may also reflect the binary “ever/never” measure and highly imbalanced exposure, particularly the six respondents who had never received information from family.

Self-reported WASH nonuse was associated with poor practice, whereas the self-reported four-core-facility WASH availability measure was not statistically associated. This difference does not show that utilisation is more important than availability because the estimates were unadjusted and a comparison of p-values is not a test of relative importance. Prior literature suggests that privacy, cleanliness, safety, acceptability, reliable water and soap, and disposal options can influence use, but these reasons for nonuse were not directly measured in this study.

Taken together, the findings identify three bivariate correlates—knowledge, information from health workers, and WASH utilisation—within an integrated predisposing, reinforcing, and enabling framework. They do not establish causal pathways or independent effects, and residual confounding remains possible.

Comparison With Existing Evidence

Previous research in rural Tamil Nadu has explored adolescent girls' experiences of menarche and menstruation, while a study in Ethiopia examined menstrual hygiene knowledge and practices among adolescent schoolgirls (15,16). The present findings are consistent with earlier studies showing that menstrual hygiene practices are an essential component of personal hygiene and play a critical role in maintaining reproductive health (18). Shalini et al. examined menstrual distress and psychological well-being among adolescents (19). Mohamed et al. investigated factors associated with menstrual hygiene practices among schoolgirls in Saudi Arabia (20). Similar findings have also been reported in developing countries, where a large proportion of adolescents continue to demonstrate inadequate menstrual hygiene practices (21). A meta-analysis from India has also examined menstrual hygiene practices and associated factors among adolescent girls (22).

Previous studies have described menstrual hygiene practices in terms of predisposing, enabling, and reinforcing factors. Knowledge, as a predisposing factor, may support recognition of recommended hygiene practices, while environmental resources and social information can enable or reinforce action (11,12). Several studies have reported associations between greater menstrual knowledge and better hygiene practices, but the strength and direction of these relationships depend on measurement and context.

However, evidence from Bangladesh highlights that knowledge alone may not be sufficient to ensure proper practice. Although 69% of adolescent girls possessed adequate knowledge, only 28.6% displayed proper menstrual hygiene behaviours, showing a discrepancy between knowledge and actual practice (23). This indicates that additional factors, such as surrounding conditions and social influences, also play an important role in shaping menstrual hygiene behaviours.

Regarding sources of information, previous research has identified mothers as a primary source of menstrual health education, with approximately 60% (24) of adolescents receiving information from them. Video-based menstrual health education has been evaluated for its effects on adolescent girls’ knowledge, attitudes, and menstrual hygiene practices (25). A separate Indonesian study investigated determinants of menstrual hygiene among schoolgirls (26). Structured health interventions, including reproductive health education, counselling, and training on menstrual hygiene management, have

also demonstrated positive impacts on adolescents' knowledge, attitudes, and practices (27). These results emphasise the importance of structured and evidence-informed education, along with cooperation between schools and healthcare providers, in enhancing menstrual hygiene behaviour (28,29). Health education has also been evaluated as an approach to improving menstrual hygiene knowledge and practices among adolescent girls in rural India (30).

Environmental conditions, especially WASH facilities, have been widely discussed in previous literature as contextual influences on menstrual hygiene practices. Earlier studies report that restricted access to clean water, private sanitation, and appropriate disposal systems can hinder hygiene during menstruation. Reports of dirty, uncomfortable, or poorly maintained toilets and insufficient bins or water are findings from those cited studies, not observations demonstrated by the present dataset. A study in Bangladesh documented changes in school menstrual hygiene management facilities and their use between 2014 and 2018 (31). Research among female college students in Nigeria has also examined WASH-related aspects of menstrual hygiene practices (32). Research in Visakhapatnam, India, has evaluated hygiene and sanitation conditions among schoolchildren (33).

Previous studies have also reported that sociocultural beliefs, taboos, and menstruation-related stigma can discourage changing menstrual materials or using school facilities. These factors were not measured in the present study and are offered only as possible explanations requiring direct investigation.

The broader literature therefore supports a comprehensive approach that considers knowledge, the quality of information and support, and WASH conditions and use. In the present study, however, conclusions are limited to the measured bivariate associations.

An Indonesian undergraduate thesis examined menstrual hygiene knowledge, practices, and WASH facility use among primary-school girls in Malang (34).

Strengths and Limitations

First, the cross-sectional design precludes establishing temporal order or causality. All odds ratios are unadjusted bivariate estimates, and the study did not assess independent effects or compare the relative importance of predictors.

Second, self-reported practice, information exposure, WASH utilisation, and WASH availability are vulnerable to recall and social desirability bias. Dichotomising information exposure as "ever/never" did not capture frequency, credibility, content, comprehension, or social support. The surviving documentation does not permit reconstruction of which source items or domains were retained, removed, or modified when the instrument was shortened; therefore, the construct validity of the shortened version cannot be re-verified. Separate validity and reliability coefficients, individual continuous score distributions, and the original recoding syntax were also not retained, so the exact treatment of scores equal to the documented median cut-points cannot be verified. These limitations constrain interpretation of the operational practice and knowledge categories.

Third, participants were recruited from two schools. Aggregate per-school recruitment counts were recovered from the study sample-unit records, but individual school identifiers were not retained in the analytic file. The analysis therefore treated students as independent and could not describe between-school variation, account for school-level clustering, or conduct a sensitivity analysis by school. This may have produced confidence intervals that are too narrow and may limit generalisability beyond the study setting.

Finally, the analysis did not include potential confounders such as age, age at menarche, parental education, socioeconomic conditions, access to menstrual products, or school policies. The WASH questionnaire contained 14 availability items, but the binary analytical variable was based only on four core facilities; the 10 additional items were not incorporated into that category. Although the questionnaire also recorded soap, a lockable door, lighting, spare sanitary pads, and other additional facilities, these were not part of the binary WASH availability variable used in Table 2; other characteristics such as cleanliness, continuity of water, safety, acceptability, and menstrual-material disposal were not captured comprehensively. Cultural beliefs, taboos, psychosocial factors, and specific reasons for facility nonuse were also not measured.

Implications for Research and Practice

An intervention study in Ethiopia evaluated the effects of school-based menstrual hygiene management and WASH interventions on girls' health and educational outcomes (35).

Future longitudinal and intervention studies should evaluate temporal and causal pathways among menstrual knowledge, information exposure, WASH conditions, WASH use, and hygiene practices.

Future studies should use validated multidimensional instruments, retain continuous score distributions, and assess the frequency, credibility, quality, content, and social support functions of information sources together with comprehensive menstrual-hygiene WASH indicators.

School-based menstrual health education, health-worker involvement, and improvements that make WASH facilities private, safe, clean, reliable, acceptable, and usable are reasonable intervention targets, but their effects should be evaluated prospectively rather than inferred from the present associations.

Studies sampling more schools and regions should retain school identifiers, report recruitment by school, and use analyses that account for clustering and relevant individual- and school-level confounders.

CONCLUSION

In this cross-sectional sample of 246 eighth-grade girls, low knowledge, never receiving menstrual information from health workers, and WASH nonuse were associated with poor menstrual hygiene practices in unadjusted bivariate analyses. Information from family, teachers, peers, or media and self-reported core WASH availability were not statistically associated.

These findings do not establish causality, independent effects, or the relative importance of utilisation and availability. They support prospective evaluation of school-based menstrual health education and interventions that enable appropriate WASH use.

DECLARATIONS

Author contributions: Ela Nurdiawati: Conceptualization, Methodology, Supervision, Writing – original draft, and Writing – review & editing. Farah Fauziyah: Methodology, Investigation, Data curation, and Formal analysis. Sita Oktafiani Eka Putri: Writing – review & editing. All authors have reviewed and approved the final manuscript and agree to be accountable for their respective contributions and the integrity of the work.

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The authors critically reviewed and edited the AI-assisted content with reference to the original research documentation, questionnaires, analytical tables, and relevant scientific literature. The research data and original statistical analyses were not generated by ChatGPT. All scientific interpretations and conclusions were evaluated and approved by the authors.

The authors take full responsibility for the accuracy, originality, scientific integrity, and final content of the manuscript.

Data Availability: The data supporting the findings of this study are not publicly available due to ethical and confidentiality considerations involving adolescent participants. Requests for access to de-identified data may be directed to the corresponding author and will be considered subject to institutional approval and applicable ethical and data protection requirements. The dataset has not been deposited in a public repository, and no persistent identifier is available.

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