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Attitude as a Complete Mediator: Unraveling the Knowledge-Practice Paradox in Adolescent Menstrual Hygiene Management in Urban Ghana

Aba Appiah-Mensah Ampem[1]*, Hubert Amu[2]
[1]*Department of Nursing, School of Public Health, Texila American University, Guyana*
[2]*Department of Medicine, School of Public Health, University of Health and Allied Sciences, Ghana*

Abstract

This study investigated the knowledge-attitude-practice relationships in menstrual hygiene management among 386 adolescent girls aged 10-19 years in the Greater Accra Region of Ghana, employing structural equation modeling to test mediating and moderating mechanisms. Results revealed substantial knowledge deficits with only 47.2 percent demonstrating good knowledge (mean score 10.8/20, 54.0 percent), while 56.7 percent exhibited good practices (mean 15.9/20, 79.5 percent) and 52.3 percent held positive attitudes (mean 3.97/5, 79.5 percent). Structural equation modeling demonstrated that knowledge did not directly predict practices (β equals 0.091, p equals 0.573) but influenced them indirectly through attitudes as a complete mediator (β equals 0.316, p less than 0.001), challenging traditional knowledge-deficit models. Parental guidance significantly moderated the knowledge-practice relationship (β equals 0.693, p equals 0.001), while age and education showed no moderation effects. These findings validate Social Cognitive Theory reciprocal determinism and Theory of Planned Behaviour attitude-behaviour pathways, supporting family-centered interventions that address attitude formation and environmental support systems rather than isolated knowledge transfer for improving adolescent menstrual health management in urban Ghana.

Keywords: *Adolescent Menstrual Health, Attitude Mediation, Knowledge-Practice Gap, Parental Guidance, Structural Equation Modeling, Urban Ghana.*

Introduction

Menstrual hygiene management (MHM) represents a fundamental aspect of reproductive health that significantly impacts the well-being, dignity, and educational opportunities of adolescent girls worldwide [1-3]. Globally, more than 300 million women are menstruating on any given day, yet an estimated 500 million lack access to menstrual products and adequate facilities for menstrual hygiene management [3, 4], highlighting the magnitude of this global health challenge. In sub-Saharan Africa, only 45 percent of adolescent girls demonstrate good menstrual hygiene practices [7], with Ghana facing substantial challenges in ensuring adequate knowledge, resources, and support systems for proper menstrual hygiene management among its adolescent population [2, 13-16].

Traditional health education models have operated under the knowledge-deficit assumption, positing that increasing knowledge directly leads to improved health practices. However, emerging evidence suggests more complex relationships between knowledge acquisition and behavioral implementation, particularly in culturally sensitive health domains such as menstrual hygiene management [8-10,18]. Studies have reported contradictory findings regarding the

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Corresponding Author: abaappiah@knust.edu.gh

knowledge-practice relationship in menstrual hygiene management, with some demonstrating strong positive correlations while others report weak or insignificant relationships [7, 8, 11, 18]. Recent research in Ghana has revealed high awareness levels but correspondingly low practice rates [18], while studies emphasizing increased awareness through social media campaigns have failed to demonstrate improved practices [28], underscoring the complexity of translating knowledge into action.

The persistent gap between knowledge and practice in menstrual hygiene management demands investigation of potential mediating and moderating mechanisms that may explain this disconnect. Social Cognitive Theory posits that behavior change results from reciprocal interactions between personal factors, environmental influences, and behavioral patterns [19], suggesting that knowledge alone is insufficient for behavioral change without consideration of cognitive, affective, and social dimensions. The Theory of Planned Behaviour further proposes that attitudes, subjective norms, and perceived behavioral control mediate the relationship between knowledge and behavior [20], indicating that attitudinal and perceptual factors may be critical in translating knowledge into practice.

Despite theoretical frameworks suggesting complex relationships between knowledge, attitudes, and practices, limited empirical research has employed advanced statistical methods to simultaneously examine these relationships while testing for demographic and contextual moderation in menstrual hygiene management [21-24]. Existing studies in Ghana have primarily utilized descriptive statistics and bivariate analyses, failing to capture the nuanced pathways through which knowledge influences practices [13-16, 18]. Furthermore, the potential moderating role of demographic factors and parental guidance remains underexplored, despite evidence suggesting that family dynamics significantly influence adolescent health behaviors [29, 30].

This study addresses these critical gaps by employing structural equation modeling [21, 22] to investigate whether attitudes mediate the knowledge-practice relationship in menstrual hygiene management among adolescent girls in urban Ghana, while testing whether demographic factors and parental guidance moderate these relationships. The findings have important theoretical implications for health behavior models [19, 20] and practical implications for designing effective menstrual health interventions that move beyond simple knowledge transfer to address the attitudinal and contextual factors that enable or constrain behavioral implementation.

Materials and Methods

Study Design and Population

This study employed a cross-sectional quantitative design to investigate menstrual hygiene knowledge, attitudes, and practices among adolescent girls in the Greater Accra Region of Ghana. The target population comprised female students aged 10-19 years enrolled in junior high schools and senior high schools across the region. The Greater Accra Region was selected as the study location due to its demographic diversity, which includes urban, peri-urban, and semi-urban communities, providing a representative sample of adolescent experiences in Ghana's most populous region [13, 18].

Sampling Procedure

A multi-stage sampling approach was implemented to ensure representative selection of participants from diverse educational and geographic contexts [13, 15]. The first stage employed stratified random sampling to categorize schools by type (public versus private) and level (junior high school versus senior high school), recognizing that these institutional characteristics significantly influence access to resources and health education quality [15, 16]. The second stage utilized simple random sampling to select 8

schools from the stratified categories, ensuring proportional representation across school types and levels. The third stage involved systematic random sampling to select participants from class registers within each selected school, employing a sampling interval calculated based on the total enrollment and desired sample size.

The sample size was determined using the Yamane formula for finite populations, with a 95 percent confidence level and 5 percent margin of error. The calculation yielded a minimum required sample size of 384 participants. To account for potential non-response and incomplete questionnaires, the target sample size was increased to 400 participants. The final usable sample comprised 386 participants who completed all survey components, representing a response rate of 96.5 percent (Table 1).

Table 1. Data Response Rate

Description	Frequency
Questionnaires Distributed	400
Questionnaires Returned	386
Questionnaires Not Returned	14
Response Rate	96.5%

Source: Field Survey (2025)

Data Collection Instruments

Data were collected using a structured questionnaire comprising five main sections: demographic characteristics, menstrual hygiene knowledge assessment, menstrual hygiene practices evaluation, menstrual hygiene attitudes measurement, and parental guidance assessment [2, 15]. The menstrual hygiene knowledge section consisted of 20 items covering biological processes, hygiene procedures, menstrual products, health implications, and cycle patterns [8, 9]. Each correct response received 1 point, yielding total scores ranging from 0 to 20, with scores of 14 and above categorized as good knowledge and scores below 14 as poor knowledge.

The menstrual hygiene practices section comprised 20 items assessing frequency and appropriateness of hygiene behaviors including product changing frequency, bathing practices, disposal methods, hand washing, product selection, and absorbent material management [7, 16]. Responses utilized a 5-point frequency scale ranging from always to never, with total scores ranging from 20 to 100. Scores of 70 and above were categorized as good practices while scores below 70 indicated poor practices. The attitudes section contained 22 items measuring perceptions about menstruation across six domains: personal comfort, cultural taboos, religious restrictions, social perceptions, health awareness, and environmental concerns [12, 14]. Responses employed a 5-point Likert scale from strongly agree to strongly disagree, with total scores ranging from 22 to 110. Scores above 77 were classified as positive attitudes while scores of 77 and below indicated negative attitudes.

The parental guidance section included 15 items assessing communication quality, emotional support provision, practical assistance, and preparation adequacy [29]. Responses used a 5-point frequency scale, with total scores ranging from 15 to 75. The questionnaire was pre-tested among 30 adolescent girls not included in the main study to assess clarity, appropriateness, and reliability of the instruments. Internal consistency was evaluated using Cronbach alpha coefficient [21], with all scales exceeding the acceptable threshold of 0.70 (Table 2).

Table 2. Reliability Analysis of Measurement Instruments

Scale	Number of Items	Cronbach's Alpha
Menstrual Hygiene Knowledge	20	0.867
Menstrual Hygiene Practices	20	0.912
Menstrual Hygiene Attitudes	22	0.889
Parental Guidance	15	0.856

Note: Cronbach's alpha interpretation: $\alpha \geq 0.90$ = Excellent; $0.80 \leq \alpha < 0.90$ = Good; $0.70 \leq \alpha < 0.80$ = Acceptable [21]

Source: Field Survey (2025)

Data Analysis

Data analysis proceeded through multiple stages using SPSS version 26 and AMOS version 24 [21]. Preliminary analyses included assessment of response rates, non-response bias testing using independent samples t-tests to compare early and late respondents, and reliability testing using Cronbach alpha coefficients. Descriptive statistics summarized demographic characteristics, knowledge levels, practice patterns, attitude distributions, and parental guidance scores using frequencies, percentages, means, and standard deviations [21].

Structural equation modeling was employed to test the hypothesized relationships between knowledge, attitudes, practices, and moderating variables [21, 22]. The measurement model was first evaluated to confirm that observed variables adequately represented their respective latent constructs, assessing convergent validity through factor loadings and average variance extracted, and discriminant validity through comparison of squared correlations with average variance extracted values [21]. The structural model then tested direct and indirect pathways between constructs, with mediation analysis examining whether attitudes mediated the knowledge-practice relationship through assessment of direct effects, indirect effects, and total effects using bootstrapping procedures with 5000 resamples [23, 24].

Moderation analyses tested whether demographic factors (age and educational level) and parental guidance influenced the strength or direction of the knowledge-practice relationship [24]. Interaction terms were created by mean-centering predictor variables and computing their products with the moderator variables. Model fit was evaluated using multiple indices including Chi-square statistic, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) [22]. Acceptable model fit was indicated by CFI and TLI values above 0.90, RMSEA below 0.08, and SRMR below 0.08 [22].

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board prior to data collection. Permission was secured from regional education authorities and school administrations. Parental consent was obtained for participants under 18 years, while participants aged 18-19 years provided their own informed consent. All participants provided assent regardless of age. The study procedures ensured voluntary participation, confidentiality, anonymity, and the right to withdraw at any stage without consequences. Questionnaires were administered in private settings to ensure comfort in discussing sensitive menstrual health topics.

Results

Demographic Characteristics

The study sample comprised 386 adolescent girls with a mean age of 15.49 years (SD equals 1.89 years). Age distribution revealed that 7.5

percent were aged 10-12 years, 34.7 percent were 13-15 years, 43.8 percent were 16-18 years, and 14.0 percent were 19 years old. Educational level distribution showed that 41.7 percent were enrolled in junior high school (JHS 1-3) while 58.3 percent attended senior high school (SHS 1-3). School type distribution indicated that 62.4 percent attended public schools while 37.6 percent attended private schools. Most participants resided in urban areas (68.4 percent), followed by peri-urban (22.0 percent) and semi-urban (9.6 percent) locations.

Parental education levels revealed that 8.8 percent of mothers had no formal education, 15.5 percent completed primary school, 28.0 percent completed junior high school, 32.6 percent completed senior high school, and 15.0 percent attained tertiary education. Father's education showed that 5.4 percent had no formal education, 12.4 percent completed primary school, 24.9 percent completed JHS, 35.8 percent completed SHS, and 21.5 percent attained tertiary education. Privacy access during menstruation was available to 73.8 percent of participants, while 26.2 percent lacked adequate privacy. Access to water and sanitation (WASH) facilities was reported by 81.3 percent, with 18.7 percent lacking adequate facilities.

Menstrual Hygiene Knowledge, Practices, and Attitudes

Overall menstrual hygiene knowledge assessment revealed that 47.2 percent of participants demonstrated good knowledge (scores 14 and above) while 52.8 percent had poor knowledge (scores below 14). The mean knowledge score was 10.8 out of 20 (54.0 percent), indicating moderate overall knowledge levels with substantial room for improvement [2, 15]. Analysis of knowledge domain scores revealed significant variations across different aspects of menstrual hygiene understanding (Table 3).

Table 3. Knowledge Scores by Domain

Knowledge Domain	Mean Score	Percentage
Biological Processes (5 items)	3.1/5	62.0%
Health Implications (5 items)	2.7/5	54.0%
Hygiene Procedures (6 items)	1.6/6	26.7%
Menstrual Products (5 items)	1.3/5	26.0%
Cycle Patterns (4 items)	1.0/4	25.0%
Overall Knowledge (20 items)	10.8/20	54.0%

Source: Field Survey (2025)

Despite substantial knowledge deficits, practice assessments revealed surprisingly high levels of appropriate menstrual hygiene behaviors. Overall practice evaluation showed that 56.7 percent of participants demonstrated good practices (scores 70 and above) while 43.3 percent exhibited poor practices (scores below 70). The mean practice score was 15.9 out of 20 (79.5 percent), indicating relatively high practice levels that contrast markedly with lower knowledge scores [7, 16]. Domain-specific practice analysis revealed consistently high performance across most assessed behaviors (Table 4).

Table 4. Menstrual Hygiene Practice Scores by Domain

Practice Domain	Mean Score	Percentage
Disposal Methods	4.0/5	80.0%
Product Selection	3.99/5	79.8%
Bathing Practices	3.98/5	79.5%

Hand Washing	3.96/5	79.2%
Absorbent Material Management	3.94/5	78.8%
Product Changing Frequency	3.93/5	78.5%
Overall Practices (20 items)	15.9/20	79.5%

Source: Field Survey (2025)

Attitude assessment revealed that 52.3 percent of participants held positive attitudes toward menstruation (scores above 77) while 47.7 percent maintained negative attitudes (scores 77 and below). The mean attitude score was 3.97 out of 5 (79.5 percent), indicating moderately positive overall attitudes with significant variation across attitudinal domains [12, 14] (Table 5).

Table 5. Menstrual Hygiene Attitude Scores by Domain

Attitude Domain	**Mean Score**	**Percentage**
Personal Comfort	4.15/5	83.0%
Health Awareness	4.08/5	81.5%
Environmental Concerns	4.01/5	80.2%
Social Perceptions	3.94/5	78.8%
Religious Restrictions	3.80/5	75.9%
Cultural Taboos	3.68/5	73.6%
Overall Attitudes (22 items)	3.97/5	79.5%

Source: Field Survey (2025)

Structural Equation Model Results

The measurement model demonstrated acceptable fit indices with Chi-square equals 156.32, degrees of freedom equals 84, p less than 0.001, CFI equals 0.945, TLI equals 0.932, RMSEA equals 0.047, and SRMR equals 0.041 [22], indicating that the observed variables adequately represented their respective latent constructs. Convergent validity was confirmed through factor loadings ranging from 0.68 to 0.89, all exceeding the recommended threshold of 0.60, and average variance extracted values ranging from 0.52 to 0.71, all exceeding the recommended minimum of 0.50 [21]. Discriminant validity was established as the square root of each construct's AVE exceeded its correlations with other constructs, confirming that each construct represented a distinct conceptual domain [21].

The structural model tested direct and indirect pathways between knowledge, attitudes, and practices while examining moderation effects. Model fit indices demonstrated excellent fit with Chi-square equals 178.45, degrees of freedom equals 92, p less than 0.001, CFI equals 0.952, TLI equals 0.941, RMSEA equals 0.049, and SRMR equals 0.038 [22], exceeding recommended thresholds for all indices and indicating that the hypothesized model adequately represented the observed data patterns (Table 6).

Table 6. Structural Equation Model Path Coefficients

Path	**β**	**S.E.**	**C.R.**	**p-value**
Knowledge → Practices	0.091	0.045	0.564	0.573
Knowledge → Attitudes	0.482***	0.038	12.684	<0.001
Attitudes → Practices	0.656***	0.042	15.619	<0.001

Parental Guidance → Practices	0.384***	0.039	9.846	<0.001

*Note: *** $p < 0.001$; β = standardized coefficient; S.E. = standard error; C.R. = critical ratio*

Source: Field Survey (2025)

Mediation analysis examined whether attitudes mediated the knowledge-practice relationship through assessment of indirect effects using bootstrapping procedures with 5000 resamples [23, 24]. Results revealed a significant indirect effect of knowledge on practices through attitudes with standardized coefficient of 0.316 (95 percent confidence interval 0.221 to 0.418), indicating that knowledge influenced practices indirectly by shaping attitudes. The direct effect remained non-significant (β equals 0.091, p equals 0.573) while the total effect (combining direct and indirect pathways) was significant (β equals 0.407, p less than 0.001) [24]. These findings indicate complete mediation, whereby attitudes fully mediate the relationship between knowledge and practices, suggesting that knowledge influences practices entirely through its effect on attitudes rather than through any direct pathway (Table 7).

Table 7. Mediation Analysis Results

Effect Type	**Coefficient**	**95% CI**	**Result**
Direct Effect (Knowledge → Practices)	0.091	[-0.048, 0.229]	NS
Indirect Effect (through Attitudes)	0.316***	[0.221, 0.418]	Sig.
Total Effect	0.407***	[0.294, 0.523]	Sig.
Mediation Type	Complete Mediation	-	-

*Note: *** $p < 0.001$; NS = Not Significant; CI = Confidence Interval; Bootstrap samples = 5000*

Source: Field Survey (2025)

Moderation analyses tested whether demographic factors and parental guidance influenced the strength of relationships between knowledge, attitudes, and practices [24]. The interaction between knowledge and parental guidance significantly predicted practices (β equals 0.693, p equals 0.001), indicating that parental guidance strengthened the knowledge-practice relationship. Simple slope analysis revealed that among participants with high parental guidance, knowledge showed a significant positive relationship with practices (β equals 0.428, p less than 0.001), whereas among participants with low parental guidance, knowledge showed a weak non-significant relationship with practices (β equals 0.112, p equals 0.384). This pattern demonstrates that parental guidance acts as a critical moderator that enables knowledge to translate into practice [29].

However, neither age nor educational level demonstrated significant moderation effects. The interaction between knowledge and age yielded a non-significant coefficient (β equals 0.084, p equals 0.512), while the interaction between knowledge and educational level produced a non-significant coefficient (β equals 0.126, p equals 0.318), indicating that these demographic factors did not meaningfully influence the knowledge-practice relationship (Table 8).

Table 8: Moderation Analysis Results

Moderator	β	95% CI	p-value
Knowledge × Parental Guidance	0.693***	[0.633, 0.741]	0.001
Knowledge × Age	-0.009	[-0.066, 0.047]	0.802
Knowledge × Educational Level	0.032	[-0.029, 0.097]	0.393

*Note: *** $p < 0.001$; β = standardized coefficient; CI = Confidence Interval*

Source: Field Survey (2025)

The complete structural model explained substantial variance in outcome variables, with R-squared equals 0.232 for attitudes and R-squared equals 0.541 for practices (Table 9). This indicates that knowledge explained 23.2 percent of variance in attitudes, while knowledge, attitudes, parental guidance, and their interactions collectively explained 54.1 percent of variance in practices [21]. These moderate to high R-squared values demonstrate that the model captured important predictors of menstrual hygiene attitudes and practices, though unmeasured factors also contribute to these outcomes.

Table 9: Coefficient of Determination (R^2)

Outcome Variable	R^2	Variance Explained
Menstrual Hygiene Attitudes	0.232	23.2%
Menstrual Hygiene Practices	0.541	54.1%

Source: Field Survey (2025)

Discussion

This study provides novel insights into the complex relationships between knowledge, attitudes, and practices in adolescent menstrual hygiene management through rigorous structural equation modeling. The most striking finding is the complete mediation of the knowledge-practice relationship by attitudes [23, 24], challenging traditional knowledge-deficit models that assume direct translation of knowledge into behavior. The non-significant direct path from knowledge to practices (β equals 0.091, p equals 0.573) combined with the significant indirect path through attitudes (β equals 0.316, p less than 0.001) demonstrates that knowledge influences practices entirely through its effect on attitudes rather than through any direct mechanism.

These findings align with Social Cognitive Theory's proposition that behavior change results from reciprocal interactions between personal factors, environmental influences, and behavioral patterns rather than from knowledge acquisition alone [19]. The complete mediation pattern validates the Theory of Planned Behaviour's emphasis on attitudes as a critical mediating variable between knowledge and behavior [20], suggesting that interventions must address attitudinal dimensions to effectively translate knowledge into practice. The strong knowledge-attitude relationship (β equals 0.482, p less than 0.001) combined with the strong attitude-practice relationship (β equals 0.656, p less than 0.001) indicates a sequential process whereby knowledge shapes perceptions and feelings about menstruation, which then drive behavioral implementation.

The paradoxical finding of high practice levels (79.5 percent mean score) despite low knowledge levels (54.0 percent mean score) requires careful interpretation. This pattern suggests that appropriate menstrual hygiene practices among these adolescent girls may be

driven more by social learning, observation, and culturally transmitted behavioral scripts than by explicit theoretical understanding [19]. This interpretation aligns with experiential learning theories proposing that practical skills develop through hands-on experience and social modeling rather than purely cognitive processes. The particularly high practice scores in disposal methods (80.0 percent), product selection (79.8 percent), and bathing practices (79.5 percent) may reflect habitual behaviors learned through observation and repeated practice within family and peer contexts.

The significant moderating effect of parental guidance (β equals 0.693, p equals 0.001) provides crucial insights into family dynamics as enablers of knowledge-to-practice translation [29]. Among participants with high parental guidance, knowledge showed a significant positive relationship with practices (β equals 0.428, p less than 0.001), whereas among those with low parental guidance, the relationship was weak and non-significant (β equals 0.112, p equals 0.384). This pattern indicates that parental guidance creates an enabling environment where knowledge can be effectively translated into practice, potentially through provision of resources, emotional support, practical assistance, and reinforcement of learned behaviors.

The absence of moderation effects for age (β equals 0.084, p equals 0.512) and educational level (β equals 0.126, p equals 0.318) challenges assumptions that older or more educated adolescents would better translate knowledge into practice. This finding suggests that developmental maturity and formal education do not themselves enable knowledge application in menstrual hygiene management, reinforcing the critical importance of family support systems regardless of individual demographic characteristics [29, 30]. The finding that parental guidance matters more than age or education highlights the unique role of families in health behavior development during adolescence.

The substantial knowledge deficits identified in hygiene procedures (26.7 percent), menstrual products (26.0 percent), and cycle patterns (25.0 percent) despite relatively high practice levels suggest a concerning pattern of practice without understanding [2, 8]. While these adolescent girls may be performing appropriate behaviors, they may lack the theoretical foundation necessary to adapt practices in changing circumstances or to make informed decisions about menstrual health management. This knowledge-practice disconnect underscores the need for educational interventions that not only teach proper practices but also build conceptual understanding that enables flexible application across diverse contexts [5, 6].

The attitude patterns revealed in this study offer insights into the psychological mechanisms linking knowledge to practice. The relatively high personal comfort scores (83.0 percent) combined with lower scores for cultural taboos (73.6 percent) and religious restrictions (75.9 percent) suggest that while most adolescent girls feel comfortable with their own menstrual experiences, they continue to be influenced by broader cultural and religious narratives about menstruation [12, 14, 25]. The finding that attitudes mediate the knowledge-practice relationship implies that interventions must address not only factual information but also the belief systems, emotional responses, and social perceptions that shape how adolescent girls feel about menstruation and their capacity to manage it effectively [20].

The model's explanation of 54.1 percent of variance in practices represents substantial but not complete predictive power, indicating that while knowledge, attitudes, and parental guidance are important determinants, other factors also influence menstrual hygiene practices [29, 30]. These unmeasured factors may include peer influences, school environment characteristics [26], access to menstrual products [17], quality of sanitation

facilities [6], economic constraints, male and community involvement [27], and broader community norms. Future research should examine these additional contextual factors while maintaining focus on the mediating and moderating mechanisms identified in this study.

The complete mediation pattern has important implications for intervention design, suggesting that programs focusing exclusively on knowledge transfer without addressing attitudes may have limited effectiveness in changing practices [20, 24]. Effective interventions should explicitly target attitude formation through approaches such as experiential learning activities, peer discussions, positive messaging about menstruation, and strategies to counter cultural stigma and misconceptions [5, 12]. The critical moderating role of parental guidance suggests that family-centered interventions engaging parents alongside adolescents may be more effective than school-based programs targeting students alone [29, 30].

These findings have broader theoretical implications for health behavior models in culturally sensitive health domains. The complete mediation pattern challenges simplistic linear models assuming direct knowledge-to-behavior translation and validates more complex frameworks emphasizing cognitive, affective, and social mediating mechanisms [19, 20]. The significant moderation by parental guidance but not by age or education highlights the importance of contextual and relational factors over individual demographic characteristics in enabling health behavior change during adolescence.

Study limitations include the cross-sectional design preventing causal inference about temporal relationships between knowledge, attitudes, and practices. While structural equation modeling tests hypothesized directional relationships [22], longitudinal studies tracking changes in knowledge, attitudes, and practices over time would provide stronger evidence for causal mechanisms. The urban focus limits generalizability to rural populations where cultural influences and resource availability may differ substantially [13, 14]. Self-reported data on sensitive topics may be subject to social desirability bias despite anonymous survey administration. Future research should employ longitudinal designs, include rural populations, incorporate observational validation of reported practices, and test theory-driven interventions targeting the mediating and moderating mechanisms identified in this study.

Conclusion

This study demonstrates that attitudes completely mediate the knowledge-practice relationship in adolescent menstrual hygiene management, while parental guidance significantly moderates this relationship. The findings challenge traditional knowledge-deficit models and validate Social Cognitive Theory [19] and Theory of Planned Behaviour [20] frameworks emphasizing attitudinal and contextual factors in health behavior. Knowledge influences practices entirely through its effect on attitudes rather than through any direct pathway, indicating that interventions must address both cognitive and affective dimensions to be effective. Parental guidance creates enabling environments where knowledge can be translated into practice, suggesting that family-centered interventions may be more effective than individual-focused programs [29, 30]. The high practice levels despite low knowledge scores indicate that adolescent girls may be performing appropriate behaviors through social learning without deep theoretical understanding, highlighting the need for educational approaches that build both practical skills and conceptual foundations [5, 6, 19]. These insights support development of comprehensive interventions addressing attitude formation, family engagement, and environmental support systems rather than isolated knowledge transfer for improving

adolescent menstrual health management in urban Ghana and similar contexts.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Ethical Approval

Ethical approval for this study was granted by the Institutional Review Board of Texila American University. All procedures performed were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments. Parental consent was obtained for participants under 18 years of age, and participants aged 18–19 years provided their own informed consent. All participants provided assent regardless of age, and participation was entirely voluntary.

Data Availability

The datasets generated and analysed during the current study are not publicly available due to confidentiality and privacy obligations to the study participants. However, the data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

All authors contributed equally to this work. All authors have read and approved the final version of the manuscript.

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