

Menstrual poverty, menstrual attitudes, and genital hygiene behaviors among adolescents: a cross-sectional study

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ABSTRACT

Background. This study aimed to examine the relationships between menstrual poverty, menstrual attitudes, and genital hygiene behaviors among adolescents, and to evaluate the influence of socio-demographic factors.

Methods. A cross-sectional study was conducted with 215 adolescent girls aged 15–19 years in Türkiye. Data were collected online using a questionnaire including socio-demographic information and three validated scales: Menstrual Poverty Scale (MPS), Menstrual Attitude Questionnaire (MAQ), and Genital Hygiene Behavior Scale (GHBS). Descriptive statistics, t-tests, ANOVA, Pearson correlations, and multiple linear regression analyses were performed.

Results. The mean age at menarche was 12.55 ± 1.16 years. MPS scores indicated moderate menstrual poverty, with the poorest scores for product access. MAQ scores were highest for Anticipation and Prediction and lowest for Denial of Any Effect, while GHBS averaged 87.11 ± 10.15 . Associations between menstrual attitudes and hygiene behaviors were weak. Reporting stigma or shame, rather than economic reasons, as the main barrier to accessing menstrual products predicted lower menstrual poverty scores (adjusted $R^2 = 6.9\%$). Menstrual irregularity was the only independent predictor of genital hygiene behaviors (adjusted $R^2 = 12.9\%$).

Conclusions. Menstrual poverty and genital hygiene behaviors were only partly explained by the variables examined. Economic barriers remained relevant to menstrual poverty, whereas menstrual irregularity was independently associated with higher genital hygiene behavior scores. Menstrual attitudes showed limited independent associations with the outcomes. The modest explanatory power of both regression models suggests that broader structural, familial, educational, and environmental factors should be considered. Interventions should combine affordable access to menstrual products with comprehensive menstrual education and supportive family, school, and community environments.

Key words: adolescent health, genital hygiene, menstrual attitude, menstrual poverty.

Adolescence is a critical developmental stage marked by physical, emotional, and social changes.¹ The onset of menstruation is a key milestone in reproductive maturation², yet for many adolescents it also reflects inequities in access to health and hygiene products.² Menstrual health is essential for global health,^{2,3} the Sustainable Development Goals, and

advancing gender equality.^{3,4} Menstrual poverty that is defined as limited access to products, inadequate sanitation, and insufficient education⁵⁻⁷ is a major global health and human rights concern.^{4,8}

Data from the World Health Organization strikingly reveal the magnitude of global

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deficiencies in menstrual health. Worldwide, only approximately 39% of schools provide menstrual health education, and only 31% have waste bins for menstrual waste in toilets. When regional differences are considered, the situation becomes even more evident. In Central and Southern Asia, 39% of schools provide menstrual education, while this rate declines to 30% in Sub-Saharan Africa. In Least Developed Countries, only 17% of schools have waste disposal facilities. At the local level, data show that the situation is much more critical in some regions: for example, waste bins were observed in only 1% of schools in Tajikistan, and only 3% of students in Ethiopia reported having access to dedicated waste bins. In India, when menstrual waste management facilities such as covered bins or incinerators are included in the criteria, the proportion of schools with basic sanitation service levels decreases to as low as 18%.⁹ In the U.S., nearly half of high school girls had been unable to purchase products and 17% missed school as a result;⁵ among university students, 17.1% reported financial difficulties, 55.8% experienced disrupted coursework, and 47.5% avoided changing products on campus.⁶ In South Africa, poor access to products and sanitation infrastructure has negatively affected attendance and Quality of Life,¹⁰ while in Türkiye, financial difficulties in accessing products were linked to lower genital hygiene behavior scores.¹¹ A nationally representative study from Türkiye conducted among adolescents reported that 15% of participants experienced difficulties in accessing Menstrual Hygiene products due to financial constraints, with a higher prevalence (25%) observed in socioeconomically disadvantaged regions. The study also documented the use of improvised menstrual products (17.4%), menstrual poverty-related school absenteeism (8.9%), prolonged use of menstrual materials due to unsuitable school environments (52%), and feelings of shame when purchasing menstrual products (10.7%), all of which were significantly more prevalent in lower socioeconomic tiers. Furthermore, adolescents experiencing menstrual poverty were three times more likely to report moderate-

to-severe depressive symptoms.¹² Menstrual poverty therefore impacts not only material access but also daily life, school participation, and hygiene behaviors,^{13,14} and affects women even in high-income countries.¹⁵

Although menstruation is natural, cultural stigmatization and taboos persist,^{2,10,11} contributing to perceptions of shame. Menstrual attitudes are critical, as positive attitudes and self-efficacy support safe hygiene, whereas negative attitudes are associated with shame and unsafe practices,¹⁶ with implications for mental health and school attendance.⁹

Menstrual attitudes are critical determinants of health-related behaviors. According to the Health Belief Model (HBM), individuals' perceptions of susceptibility, severity, and self-efficacy shape their engagement in preventive health behaviors, including hygiene practices.¹⁷ Applied to menstrual health, adolescents who perceive menstruation negatively (as debilitating or shameful) may exhibit lower self-efficacy and reduced motivation to maintain hygiene, whereas positive attitudes and stronger self-efficacy are associated with safer practices.¹⁸ The Theory of Planned Behavior (TPB) further suggests that attitudes, subjective norms, and perceived behavioral control jointly predict health-related intentions and actions.¹⁹ In the context of Menstrual Hygiene, cultural stigmatization and taboos may undermine subjective norms and behavioral control, thereby translating negative attitudes into unsafe practices with implications for mental health and school attendance. Despite growing attention to menstrual equity, the interplay of menstrual poverty, attitudes, and genital hygiene behaviors in adolescents remains insufficiently understood. Such insights are needed to improve product access, foster positive attitudes, and promote safe hygiene practices. This study aimed to examine the relationships between menstrual poverty, menstrual attitudes, and genital hygiene behaviors among adolescent girls aged 15–19 years in Türkiye, and to evaluate the influence of socio-demographic factors on these outcomes.

The following research questions guided the study: (1) What is the level of menstrual poverty, menstrual attitudes, and genital hygiene behaviors among adolescent girls? (2) Are menstrual poverty and menstrual attitudes associated with genital hygiene behaviors? (3) Which socio-demographic factors predict menstrual poverty and genital hygiene behaviors?"

Materials and Methods

Study design and participants

This descriptive, cross-sectional study was conducted among adolescent girls aged between 15–19 years in Türkiye. Eligible participants were those who had experienced menarche, were currently menstruating, and consented to participate. Exclusion criteria included the presence of a chronic illness or cognitive impairment that could interfere with completing the questionnaire. The sample size was calculated using GPower (v3.1.7) software based on Pearson correlation analysis, assuming a medium effect size ($r = 0.20$), a significance level of 0.05 (two-tailed), and a statistical power of 80%. The minimum required sample size was determined to be 273. After exclusion of incomplete questionnaires, the final analytical sample comprised 215 participants. A post hoc power analysis using the final sample size ($n = 215$) yielded an achieved power of 76%. Although this value was lower than the originally targeted 80%, it remained within an acceptable range for detecting small-to-moderate associations. Setting and recruitment

The study was conducted using an online data collection process. Research data were collected between March and June 2025 using an online questionnaire created on Google Forms. Participants were recruited from high school students in İstanbul, Türkiye. The survey link was distributed via WhatsApp to high school students through the researchers' personal and

professional networks. Eligible participants were informed about the study's aims, eligibility criteria, and the voluntary nature of participation in the recruitment message. Before starting the survey, participants accessed an information sheet describing the study procedures. Electronic informed consent was obtained prior to completing the questionnaire.

Data collection tools

Data were collected using a structured online questionnaire consisting of two parts. The first part included 17 items on sociodemographic and menstruation-related characteristics (e.g., age, school grade, age at menarche, menstrual cycle regularity, menstrual pain, and hygiene practices). The second part comprised three scales: Menstrual Poverty Scale (MPS), Menstrual Attitude Questionnaire (MAQ), Genital Hygiene Behavior Scale (GHBS).

Menstrual Poverty Scale (MPS): The MPS was developed by Öz Yıldırım et al. in 2024.²⁰ The scale consists of 13 items and four subscales: Access to Hygiene Products, Quality of Life, Embarrassment, and Receiving Information and Education. It is a 5-point Likert-type scale (ranging from 1 = Strongly Disagree to 5 = Strongly Agree). Higher scores indicate greater menstrual poverty. Items 2, 12, and 13 are reverse-scored. The scale consists of 13 items and four subscales: Access to Hygiene Products (3 items), Quality of Life (4 items), Embarrassment (4 items), and Receiving Information and Education (2 items). In this study, the Cronbach's alpha coefficient of the scale was found to be 0.75.

Menstrual Attitude Questionnaire (MAQ): The MAQ was developed by Brooks-Gunn and Ruble in 1980,²¹ and its Turkish validity and reliability study was conducted by Kulakaç et al. in 2008.²² In its original form, the scale is a 7-point Likert-type instrument; however, the adapted Turkish version uses a 5-point Likert-type format, with scores ranging from 1

(Strongly Disagree) to 5 (Strongly Agree). The scale consists of 31 items and five subscales: Menstruation as a Debilitating Event (7 items), Menstruation as a Bothersome Event (5 items), Menstruation as a Natural Event (5 items), Anticipation and Prediction of the Onset of Menstruation (8 items), and Denial of Any Effect of Menstruation (6 items). Higher mean scores in any subscale or in the overall scale indicate a more “positive” attitude toward menstruation. The Cronbach’s alpha reliability coefficient of the scale is 0.79. In this study, the Cronbach’s alpha coefficient of the scale was found to be 0.77.

Genital Hygiene Behavior Scale (GHBS): The GHBS was developed by Karahan in 2017.²³ The scale consists of three subscales: General Hygiene Behaviors (12 items), Menstrual Hygiene (8 items), and Abnormal Finding Awareness (3 items). It contains a total of 23 items, scored on a 5-point Likert scale, with possible total scores ranging from 23 to 115. The scale measures women’s genital hygiene behaviors, with higher scores indicating a higher frequency of correct genital hygiene practices. In the original form of the scale, Cronbach’s alpha coefficients were 0.80 for the GHBS total, 0.70 for General Hygiene Behaviors, 0.74 for Menstrual Hygiene, and 0.81 for Abnormal Finding Awareness. In this study, the Cronbach’s alpha coefficient of the scale was found to be 0.78.

Data analysis

The data obtained from the research were evaluated using the SPSS for Windows (Statistical Package for Social Science for Windows, Version 28.0) package program. Categorical variables were presented as frequency (n) and percentage (%), while quantitative data were summarized using mean $\pm$ standard deviation (SD), and minimum-maximum values. The normality of data distribution was evaluated using the Kolmogorov–Smirnov and Shapiro–Wilk tests,

along with skewness and kurtosis values. For between-group comparisons, the Independent sample t test and one-way ANOVA test were used for continuous variables. Pearson correlation analysis was used to examine relationships between normally distributed continuous variables. Multiple linear regression analyses were conducted separately for the MPS and GHBS total scores. Candidate predictors were selected using a purposeful model-building strategy. Sociodemographic and menstruation-related variables associated with the relevant dependent variable at $p < 0.20$ in preliminary univariable analyses were considered for inclusion. In addition, the total scores of the other menstrual health scales were included because of their theoretical relevance to the study objectives, regardless of their statistical significance in the preliminary analyses. Categorical variables with more than two categories were dummy coded. All selected variables were entered simultaneously using the enter method. Multicollinearity was assessed using tolerance and variance inflation factor values. The assumptions of linearity, normality, homoscedasticity, and independence of residuals were also evaluated. A p -value < 0.05 was considered statistically significant. The MPS total score was treated as a continuous variable in all analyses, consistent with the original scale development study and with prior research employing this instrument.

Ethics approval

This study was approved by the Istanbul University Social and Human Sciences Research Ethics Committee (Date: 26.02.2025; No: 2025/46). As all participants were aged 15 years or older, individual informed consent was obtained directly from the adolescents themselves, in accordance with the ethics committee’s requirements, which stipulated parental consent only for participants under

the age of 15. Electronic informed consent was obtained from all participants prior to completing the questionnaire. All participants were fully informed about the aim and procedures of the study, and their voluntary participation was ensured. The study was conducted in accordance with the ethical standards of the Declaration of Helsinki.

Results

The socio-demographic and menstrual characteristics of adolescents are shown in Table I. The mean age was 16.22 ± 1.08 years, with a mean menarche age of 12.55 ± 1.16 years. Most of the participants lived with family (94.9%), had regular menstruation ($n=157$, 73.0%), and

Table I. Socio-demographic and menstrual characteristics of the participants ($n=215$).

Variables	Mean $\pm$ SD	Min-Max
Age (years)	16.22 ± 1.08	15-19
Age at menarche (years)	12.55 ± 1.16	9-16
Menstrual cycle length (days)	30.66 ± 8.92	20-90
Menstrual duration (days)	5.85 ± 1.22	3-10
	Categories	n (%)
Living arrangement	Dormitory	11 (5.1)
	With family	204 (94.9)
Family monthly income	Income < expenses	10 (4.7)
	Income = expenses	105 (48.8)
	Income > expenses	100 (46.5)
Mother's education	Primary school	41 (19.0)
	Secondary school	27 (12.6)
	High school	74 (34.4)
	University or above	73 (34.0)
Father's education	Primary school	30 (14.0)
	Secondary school	29 (13.5)
	High school	68 (31.6)
	University	88 (40.9)
Menstrual regularity	Yes	157 (73.0)
	No	58 (27.0)
Received menstrual education	Yes	176 (81.9)
	No	39 (18.1)
Source of menstrual information (multiple responses possible)	Mother	163 (75.8)
	Sister	7 (3.3)
	TV/Internet	5 (2.3)
	Social media	8 (3.7)
	Teacher	6 (2.8)
	Healthcare professional	12 (5.6)
	No information	14 (6.5)
Primary menstrual product used	Sanitary pad	215 (100.0)
Difficulty accessing menstrual products	Yes	7 (3.3)
	No	208 (96.7)
Main barrier to obtaining products	Economic reasons	69 (32.1)
	Product unavailability	41 (19.1)
	Social stigma/shame	46 (21.4)

The item "Difficulty accessing menstrual products" assessed whether participants had personally experienced difficulty obtaining menstrual products (Yes/No). In contrast, the item "Main barrier to obtaining products" was administered to all participants and evaluated the perceived primary barrier to menstrual product access (e.g., economic reasons, product unavailability, or social stigma/shame), irrespective of whether participants had personally experienced access difficulties. SD: standard deviation.

reported receiving menstrual education (n=176, 81.9%). When asked about the perceived primary barrier to menstrual product access, economic reasons were the most frequently reported response (n=69, 32.1%). The mean scores of the Menstrual Poverty, Menstrual Attitude, and Genital Hygiene Behavior Scales are presented in Table II. The mean MPS score was 34.19 ± 7.09 , with subscale means ranging from 6.72 ± 2.34 (Receiving Information and Education about Menstruation) to 14.21 ± 4.77 (Quality of Life). The MAQ total score was 95.13 ± 11.62 , with subscale means ranging from 11.59 ± 4.64 (Denial of Any Effect of Menstruation) to 27.61 ± 4.29 (Anticipation and Prediction of the Onset of Menstruation). The mean GHBS total score was 87.11 ± 10.15 , with subscale means of 44.78 ± 5.72 for General hygiene, 31.90 ± 4.32 for Menstrual Hygiene, and 10.42 ± 2.52 for Abnormal Finding Awareness.

The correlations between the MPS, MAQ, and GHBS are illustrated in the heatmap (Fig. 1). Menstrual poverty showed a weak but significant positive correlation with the

Menstruation as a Debilitating Event subscale ($r = 0.187, p < 0.05$) and no significant association with the total scores of the other scales. Access to Hygiene Products subscale was negatively associated with General hygiene ($r = -0.144, p < 0.05$) and Menstrual Hygiene ($r = -0.231, p < 0.05$). At the subscale level, Menstruation as a Debilitating Event was negatively correlated with Abnormal Finding Awareness ($r = -0.140, p < 0.05$), while Menstruation as a Natural Event was positively correlated with Menstrual Hygiene ($r = 0.140, p < 0.05$). The Denial of Any Effect of Menstruation subscale showed a weak negative correlation with both the GHBS total score ($r = -0.111, p < 0.05$) and the Menstrual Hygiene subscale ($r = -0.221, p < 0.05$).

As shown in Table III, the GHBS scores differed significantly by family monthly income ($F = 3.037, p = 0.048$), with higher scores among participants whose income was lower than expenses compared to those whose income exceeded expenses. Menstrual regularity was also significantly associated with GHBS scores ($t = -3.219, p < 0.001$), with higher scores in

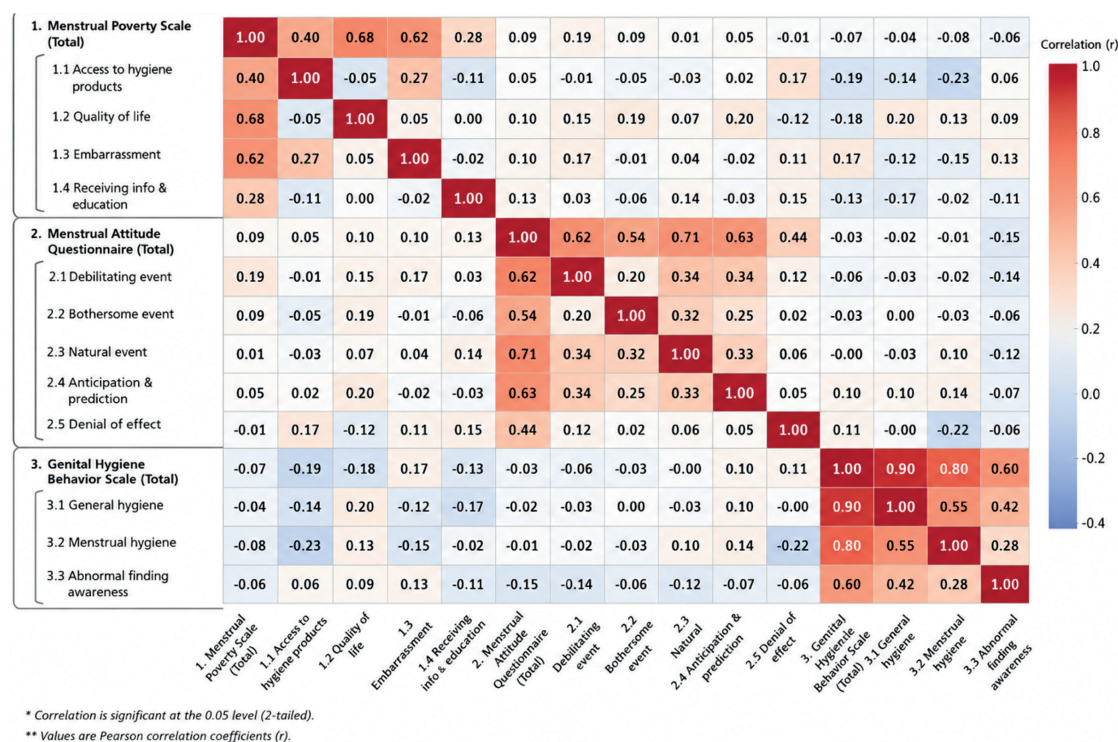


Fig. 1. Correlation heatmap: menstrual poverty, menstrual attitudes, and genital hygiene behaviors scales.

Table II. Mean scores of menstrual poverty, menstrual attitudes, and genital hygiene behaviors scales (total and subscales).

Scale	Subscales	Mean $\pm$ SD	Min-Max
Menstrual Poverty Scale	Access to Hygiene Products	4.95 $\pm$ 2.39	3.0-15.0
	Quality of Life	14.21 $\pm$ 4.77	4.0-20.0
	Embarrassment	8.28 $\pm$ 3.56	4.0-19.0
	Receiving Information and Education about Menstruation	6.72 $\pm$ 2.34	2.0-10.0
	Total	34.19 $\pm$ 7.09	17.0-53.0
Menstrual Attitude Questionnaire	Menstruation as a Debilitating Event	21.91 $\pm$ 3.06	13.0-35.0
	Menstruation as a Bothersome Event	16.59 $\pm$ 3.10	5.0-25.0
	Menstruation as a Natural Event	17.41 $\pm$ 4.53	5.0-25.0
	Anticipation and Prediction of the Onset of Menstruation	27.61 $\pm$ 4.29	12.0-40.0
	Denial of Any Effect of Menstruation	11.59 $\pm$ 4.64	6.0-30.0
	Total	95.13 $\pm$ 11.62	63.0-155.0
Genital Hygiene Behavior Scale	General hygiene	44.78 $\pm$ 5.72	20.0-60.0
	Menstrual Hygiene	31.90 $\pm$ 4.32	17.0-40.0
	Abnormal Finding Awareness	10.42 $\pm$ 2.52	3.0-15.0
	Total	87.11 $\pm$ 10.15	47.0-112.0

SD: standard deviation.

participants reporting irregular menstruation. Additionally, the MPS scores varied significantly according to the main barrier to obtaining menstrual products ($F = 3.523$, $p = 0.016$), with the highest scores observed among those citing economic reasons as the main barrier. No other socio-demographic or menstrual characteristics were significantly related to the scale scores.

The multiple linear regression analyses are presented in Table IV. In the model examining menstrual poverty, paternal education, the perceived main barrier to obtaining menstrual products, MAQ total score, and GHBS total score were included as independent variables. The model was statistically significant and explained 6.9% of the variance in menstrual poverty scores ($R^2 = 0.069$, adjusted $R^2 = 0.037$, $F(7, 207) = 2.183$, $p = 0.037$). Compared with participants who identified economic reasons as the main barrier, those who identified social stigma or shame had significantly lower menstrual poverty scores ($B = -3.195$, 95% confidence interval $-5.331, -1.060$, $\beta = -0.226$,

$p=0.004$). No other variable was a statistically significant independent predictor of menstrual poverty.

In the model examining genital hygiene behaviors, age, living arrangement, family monthly income, maternal education, menstrual regularity, receipt of menstrual education, MPS total score, and MAQ total score were included. The model was statistically significant and explained 12.9% of the variance in genital hygiene behavior scores ($R^2 = 0.129$, adjusted $R^2 = 0.081$, $F(11, 203) = 2.722$, $p = 0.003$). Menstrual irregularity was the only statistically significant independent predictor. Participants reporting irregular menstruation had genital hygiene behavior scores approximately 5.26 points higher than those reporting regular menstruation ($B = 5.258$, 95% confidence interval $[2.232-8.284]$, $\beta = 0.230$, $p=0.001$). Family monthly income, menstrual poverty, and menstrual attitudes were not independently associated with genital hygiene behavior scores in the adjusted model.

Table III. Comparison of scale scores according to socio-demographic and menstrual characteristics.

Variable	Categories	Menstrual Poverty Scale Mean ± SD	Menstrual Attitude Questionnaire Mean ± SD	Genital Hygiene Behavior Scale Mean ± SD	Menstrual Poverty Menstrual Attitude			Genital Hygiene	
					Scale	Questionnaire	Behavior	Test value	Test value
Family monthly income	Income < expenses	32.70 ±7.45	99.70 ±8.34	92.80 ±9.17	0.284*	0.817*	0.753*	0.443*	3.037*
	Income = expenses	34.10 ±7.21	95.00 ±10.55	87.97 ±10.08					0.048*
	Income > expenses	34.43 ±6.97	94.80 ±12.89	85.65 ±10.11					
Menstrual regularity	Yes	33.97 ±6.88	95.52 ±12.24	85.78 ±10.48					
	No	34.77 ±7.66	94.05 ±9.76	90.70 ±8.27	-0.734**	0.826**	0.463**	0.410**	-3.219**
Main barrier to obtaining products	Economic reasons	36.05 ±6.74	94.85 ±11.04	86.73 ±11.59	3.523*	0.127*	0.016*	0.944*	0.201*
	Product unavailability	34.85 ±6.42	95.78 ±9.34	87.39 ±9.33					0.946*
Social stigma/shame		32.17 ±7.52	95.65 ±14.30	88.02 ±8.96					

p<0.05 indicates statistical significance.
* One-way ANOVA. **Independent Samples t-test
SD: standard deviation.

Table IV. Multiple linear regression analyses of factors associated with menstrual poverty and genital hygiene behaviors among adolescents (n = 215).

Independent variables	B (95% CI)	SE	β	t	p
Model 1. Dependent variable: menstrual poverty scale total score					
Father’s education ^a					
Primary school	−0.131 (−3.045 to 2.783)	1.478	−0.006	−0.089	0.930
Secondary school	−2.300 (−5.282 to 0.682)	1.513	−0.111	−1.520	0.130
High school	−0.613 (−2.830 to 1.604)	1.124	−0.040	−0.545	0.586
Main barrier to obtaining menstrual products ^b					
Product unavailability	−1.234 (−3.942 to 1.474)	1.373	−0.069	−0.899	0.370
Social stigma/shame	−3.195 (−5.331 to −1.060)	1.083	−0.226	−2.950	0.004
Menstrual Attitude Questionnaire total score	0.065 (−0.017 to 0.147)	0.042	0.106	1.548	0.120
Genital Hygiene Behavior Scale total score	−0.039 (−0.131 to 0.054)	0.047	−0.055	−0.830	0.412
Model statistics	R ² = 0.069; adjusted R ² = 0.037; F (7, 207) = 2.183; p = 0.037				
Model 2. Dependent variable: Genital Hygiene Behavior Scale total score					
Age, years	0.629 (−0.603 to 1.861)	0.625	0.067	1.006	0.315
Dormitory residence ^c	5.210 (−1.072 to 11.493)	3.186	0.113	1.635	0.104
Family monthly income ^d					
Income lower than expenses	4.040 (−2.535 to 10.615)	3.335	0.084	1.211	0.227
Income higher than expenses	−1.903 (−4.747 to 0.940)	1.442	−0.094	−1.320	0.188
Mother’s education ^e					
Primary school	1.899 (−2.207 to 6.005)	2.083	0.074	0.912	0.363
Secondary school	−3.606 (−8.094 to 0.882)	2.276	−0.118	−1.584	0.115
High school	0.657 (−2.546 to 3.860)	1.625	0.031	0.404	0.686
Irregular menstruation ^f	5.258 (2.232 to 8.284)	1.535	0.230	3.425	0.001
No menstrual education ^g	2.483 (−0.987 to 5.954)	1.760	0.094	1.411	0.160
Menstrual Poverty Scale total score	−0.082 (−0.269 to 0.105)	0.095	−0.057	−0.863	0.389
Menstrual Attitude Questionnaire total score	−0.044 (−0.160 to 0.072)	0.059	−0.050	−0.746	0.454
Model statistics	R ² = 0.129; adjusted R ² = 0.081; F (11, 203) = 2.722; p = 0.003				

All variables were entered simultaneously using the enter method. Bold p values indicate statistical significance at $p < .05$. Reference categories: ^auniversity or above, ^beconomic reasons, ^cliving with family, ^dincome equal to expenses, ^euniversity or above, ^fregular menstruation, ^greceived menstrual education, B = unstandardized regression coefficient; β = standardized regression coefficient; CI = confidence interval; SE = standard error.

Discussion

This study investigated the interrelations among menstrual poverty, menstrual attitudes, and genital hygiene behaviors in adolescents, alongside the influence of socio-demographic factors. The majority of participants resided with their families and identified their

mothers as the primary source of menstrual information, highlighting the family's pivotal role in menstrual health education. The low percentage of participants citing teachers or health professionals as information sources underscores deficiencies in formal education. Although nearly half of the participants reported household income matching expenses,

economic constraints were the predominant barrier to accessing menstrual products. In the present study, households where income equaled expenses were considered to reflect moderate financial status, as this categorization was based on participants' own perceptions of their financial situation rather than an objective income measure. These findings suggest that menstrual poverty may also impact adolescents from households with limited but balanced financial resources, consistent with previous literature.^{7,14,15,24,25} All participants reported using pads, while the lack of alternative products (e.g., tampons, menstrual cups) may be attributed to cultural or accessibility barriers.²⁶

The MPS score was moderate, with the lowest scores in product access, consistent with previous studies.^{13,14} In the MAQ, the highest mean score was observed in the Anticipation and Prediction subscale, and the lowest in the denial of any effect, corroborating Fışkın Siyahtaş et al.²⁶ Elevated scores in the debilitating and bothersome subscales indicated predominantly negative perceptions, in agreement with Borges et al.¹⁶ The GHBS mean score was comparable to earlier research.²⁷⁻³² While general and menstrual hygiene practices were deemed adequate, low scores in awareness of abnormal findings highlighted a limited recognition of unusual symptoms, supporting the findings of Tshivule et al.¹⁰

Correlation analyses revealed weak associations between menstrual attitudes and hygiene behaviors. The denial of any effect subscale showed weak but statistically significant negative correlations with both the GHBS total score and the Menstrual Hygiene subscale, suggesting that adolescents who tend to deny any effect of menstruation may engage in slightly less attentive menstrual hygiene practices. However, given the weakness of these correlations, these findings should be interpreted with caution. A modest positive correlation was identified between anticipation and prediction and general hygiene, suggesting that awareness of menstrual signs may enhance hygiene practices, aligning with previous

research conducted in India.³² Conversely, perceiving menstruation as a debilitating event was negatively associated with awareness of abnormal findings, though the weak correlation coefficient suggests that this association should be interpreted with caution and does not allow for strong conclusions regarding attentiveness to health warning signs. Ghiasi et al.³³ similarly reported that viewing menstruation as "debilitating" was linked to lower symptom awareness and poorer self-care. Overall, menstrual attitudes appear to exert a limited influence on hygiene behaviors, which are more strongly shaped by structural and contextual determinants. This pattern is consistent with a social-ecological perspective, which posits that individual behaviors are embedded within broader environmental, institutional, and socioeconomic systems.² From this standpoint, even adolescents with positive menstrual attitudes may be unable to maintain adequate hygiene practices in the absence of affordable products, functional sanitation infrastructure, or supportive school and family environments. Conversely, structural barriers such as economic hardship and limited access to products may override the potential positive influence of attitudes on behavior. These findings suggest that attitude-focused interventions alone are unlikely to be sufficient, and that structural level changes (including ensuring affordable product access, improving school sanitation facilities, and strengthening family and community support systems) are essential prerequisites for meaningful improvements in adolescent menstrual hygiene behaviors.

Research has documented a correlation between women's monthly income and their genital hygiene behaviors.²⁶ Higher scores in genital hygiene behaviors among women with elevated income levels have been linked to improved living conditions, enhanced access to health services, and increased hygienic practices facilitated by greater economic resources.³⁴ In the present study, an unexpected relationship was identified between family income and genital hygiene behaviors. Adolescents from

households where expenses surpassed income reported higher hygiene scores compared to those from households with greater financial resources. This unexpected finding is difficult to interpret with certainty given the cross-sectional design of the study and the absence of qualitative data on participants' hygiene motivations. One possible explanation is that adolescents from financially constrained households may develop greater awareness of hygiene as a low-cost protective behavior; however, this interpretation remains speculative and should be tested in future research. It is also plausible that unmeasured variables, such as household crowding, access to water and sanitation facilities, or maternal health literacy, may confound this relationship. Similar paradoxical results have been observed in previous studies, suggesting a possible, though modest, association between awareness of menstrual signs and hygiene practices; however, the weak correlation coefficient warrants caution in inferring a directional or causal relationship. Conversely, other studies have reported no significant correlation between monthly income and the mean scores of women's genital hygiene behaviors.²⁵ Although family income was associated with genital hygiene behavior scores in the unadjusted comparison, this association was no longer statistically significant after age, living arrangement, maternal education, menstrual regularity, menstrual education, menstrual poverty, and menstrual attitudes were considered simultaneously. This suggests that the observed income-based differences may partly reflect the influence of other individual or contextual characteristics. Therefore, family income should not be interpreted as an independent determinant of genital hygiene behaviors in the present sample.

Menstrual regularity remained the only statistically significant independent predictor of genital hygiene behaviors in the adjusted model. Adolescents with irregular menstrual cycles had higher genital hygiene behavior scores than those with regular cycles. One possible explanation is that irregular menstruation

may increase attention to bodily changes and encourage more deliberate hygiene practices. However, because of the cross-sectional design, the direction of this relationship cannot be established. Furthermore, the modest explanatory power of the model indicates that menstrual regularity accounts for only a limited proportion of variation in hygiene behaviors. Similarly, previous studies have indicated that menstrual irregularities can heighten adolescents' awareness and attentiveness regarding menstrual management.³⁵⁻³⁷ Regression analysis similarly identified menstrual regularity as a statistically significant predictor of genital hygiene behaviors, though the modest explained variance suggests that this relationship should be interpreted with caution.

Adolescents who identified economic reasons as barriers to accessing menstrual products exhibited significantly higher menstrual poverty scores compared to those who attributed their challenges to product unavailability or social stigma. Economic barriers remained relevant to menstrual poverty; however, the adjusted analysis showed that adolescents identifying economic reasons as the primary barrier had higher menstrual poverty scores than those identifying social stigma or shame. Similar patterns have been observed in low- and middle-income countries, where financial limitations are closely linked to restricted access to menstrual products and adverse menstrual health outcomes.^{38,39} Regression analysis supported this finding; however, the low explained variance indicates that economic barriers, while statistically significant, account for only a small proportion of the variability in menstrual poverty scores, suggesting that additional unmeasured factors may also play an important role. Nevertheless, the relatively low explained variance in both models indicates that menstrual poverty and hygiene behaviors cannot be fully explained by individual or socio-demographic characteristics alone. These findings highlight the importance of considering environmental and contextual

factors-such as school settings, family support, and broader social norms-in shaping adolescent menstrual health outcomes.

This study highlights the multidimensional nature of adolescent menstrual health. The regression analyses showed that identifying social stigma or shame rather than economic reasons as the primary barrier was associated with lower menstrual poverty scores, while menstrual irregularity was the only independent predictor of genital hygiene behaviors. Menstrual attitudes and the other scale scores did not independently predict the outcomes after relevant sociodemographic and menstruation-related characteristics were considered. The modest explanatory power of both models indicates that menstrual poverty and genital hygiene behaviors are likely shaped by broader structural, familial, educational, and environmental factors that were not fully captured in the present study. Interventions should therefore combine affordable product access with comprehensive menstrual education and supportive school and family environments.

Limitations

Several limitations of this study should be acknowledged. Participants were recruited through online convenience sampling via WhatsApp, targeting high school students in Istanbul, Türkiye. This approach may have introduced selection bias, as students without internet access or smartphone use were systematically excluded. Furthermore, the voluntary nature of participation may have resulted in volunteer bias, whereby adolescents with greater awareness of or interest in menstrual health were more likely to participate, potentially overestimating positive attitudes and hygiene behaviors in the sample. Additionally, as the sample was drawn exclusively from high school students in Istanbul, the findings may not be generalizable to adolescents in other regions of Türkiye or to those not enrolled in formal education. These factors limit the representativeness of

the findings, and caution should be exercised when generalizing the results to the broader Turkish adolescent population. Additionally, the socioeconomic distribution of the sample was uneven, with only 4.7% of participants reporting household income below expenses. This underrepresentation of lower-income adolescents may have limited the ability to adequately evaluate the relationship between socioeconomic disadvantage and menstrual poverty, and caution should be exercised when interpreting findings related to income-based comparisons.

Ethical approval

This study was approved by the Istanbul University Social and Human Sciences Research Ethics Committee (Date: 26.02.2025; No: 2025/46). Informed consent form was added to the beginning of the online questionnaire. All participants were fully informed about the aim and procedures of the study, and their voluntary participation was ensured through the collection of written informed consent. The study was conducted in accordance with the ethical standards of the Declaration of Helsinki.

Author contribution

The authors confirm contribution to the paper as follows: Study conception and design: MT, EG, ÖŞ; data collection: EG,ÖŞ; analysis and interpretation of results: MT; draft manuscript preparation: MT, EG, ÖŞ. All authors reviewed the results and approved the final version of the manuscript.

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Conflict of interest

The authors declare that there is no conflict of interest.

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