

Menstrual Hygiene Practices and Psychosocial Impact Among School-Going Adolescent Girls Aged 10–19 Years in Indore, Central India: A Cross-Sectional Study

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Abstract

Original Research Article

Background: Menstruation remains surrounded by social taboos and restrictions in many low- and middle-income countries, adversely affecting hygiene practices, dignity, and psychosocial wellbeing among adolescent girls. Evidence from Central India simultaneously assessing both menstrual hygiene practice and psychosocial impact using standardized tools remains limited. **Objectives:** To assess menstrual hygiene practices and psychosocial impact of menstruation among school-going adolescent girls aged 10–19 years in Indore, Madhya Pradesh, and to identify sociodemographic and menstrual factors associated with poor practice and adverse psychosocial outcomes. **Methods:** A school-based, descriptive cross-sectional study was conducted among 423 school-going adolescent girls selected from ten schools in Indore using stratified systematic random sampling. Data were collected using a pre-tested, structured, self-administered questionnaire covering sociodemographic factors, menstrual characteristics, menstrual hygiene practices (scored 0–10; Good ≥ 6), and psychosocial impact (12-item scale, scored 0–48). Associations were assessed using Chi-square/Fisher's exact tests and multivariable logistic regression. **Results:** The mean age of participants was 14.63 ± 2.44 years. The mean menstrual hygiene practice score was 7.89 ± 1.76 (out of 10), with 93.6% (n=396) demonstrating good practice. The mean psychosocial impact score was 27.19 ± 5.15 (out of 48), with 23.6% (n=100) classified as experiencing high psychosocial impact (score above the 75th percentile). School absenteeism and restriction of routine activities during menstruation were the two least well-practiced items (recommended practice present in 54.6% and 45.9%, respectively). On bivariate and multivariable analysis, no sociodemographic or menstrual factor was independently associated with either menstrual hygiene practice or psychosocial impact (all $p > 0.05$). **Conclusion:** Menstrual hygiene practice was largely good in this urban school-going population, but school absenteeism and psychosocial impact of menstruation remain meaningful concerns for a substantial minority. School-based interventions addressing the psychosocial and dignity-related dimensions of menstruation, alongside hygiene infrastructure, are warranted.

Keywords: Menstrual hygiene management; Psychosocial impact; Adolescent girls; School health; Cross-sectional study; India.

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1. INTRODUCTION

Menstruation is a normal physiological process experienced by adolescent girls and represents an important milestone in reproductive development. Despite being a natural biological phenomenon, menstruation continues to be surrounded by social taboos, misconceptions, and cultural restrictions in many low- and middle-income countries, including India, adversely affecting health, dignity, educational participation, and psychosocial wellbeing [1]. The World

Health Organization (WHO) defines adolescence as the period between 10 and 19 years of age, a critical developmental stage during which menarche occurs and lifelong menstrual hygiene behaviors are established [2].

Menstrual Hygiene Management (MHM) refers to the use of clean menstrual absorbents, access to adequate facilities for changing and disposal, availability of water and soap for personal hygiene, and access to accurate information regarding menstruation [3].

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Globally, millions of adolescent girls face challenges in maintaining adequate menstrual hygiene due to limited access to sanitary products, inadequate sanitation facilities, and insufficient menstrual health education. These barriers may contribute to poor hygiene practices, discomfort, infections, reduced school participation, and psychosocial distress [3,4].

Evidence from low- and middle-income countries suggests that menstrual hygiene practices among adolescent girls remain suboptimal. A systematic review and meta-analysis conducted in Ethiopia reported that nearly half of adolescent girls practiced poor menstrual hygiene, with inadequate knowledge being a major determinant of poor practices [4]. Similarly, a qualitative meta synthesis of women's and girls' experiences in low- and middle-income countries highlighted the widespread influence of stigma, shame, secrecy, and social restrictions on menstrual experiences and wellbeing [1].

In India, menstrual hygiene management has emerged as a major public health and adolescent health concern. Although awareness and access to sanitary products have improved in recent years through government initiatives and school-based interventions, substantial disparities continue to exist across socioeconomic groups and geographical regions [5]. A systematic review and meta-analysis by Van Eijk *et al*, demonstrated considerable variation in menstrual hygiene practices across India and identified the use of unhygienic absorbents, inadequate sanitation facilities, restricted mobility, and lack of privacy as common challenges faced by adolescent girls [5].

Menstruation also has important psychosocial implications. Feelings of embarrassment, anxiety, fear of leakage, low self-confidence, and social withdrawal are frequently reported during menstruation, particularly among adolescents who lack adequate knowledge or social support [1,6]. Cultural restrictions imposed during menstruation may further limit participation in social, educational, religious, and recreational activities, negatively affecting emotional wellbeing and quality of life [6]. Sundari *et al*, reported that a considerable proportion of adolescent girls experienced psychosocial problems during menstruation, including emotional disturbances, activity restrictions, and social discomfort [6].

School absenteeism represents another important consequence of poor menstrual hygiene management. Adolescent girls may miss school because of dysmenorrhea, fear of staining, lack of privacy, inadequate sanitation facilities, or sociocultural restrictions. Recurrent absenteeism during menstruation can adversely affect academic performance, educational attainment, and social participation [7]. Recognizing these concerns, UNICEF has emphasized that menstrual health extends beyond hygiene and should be considered

an issue of health, education, gender equality, and human rights [3].

Studies from various regions of India have reported deficiencies in menstrual hygiene practices and persistent psychosocial challenges among adolescent girls [7,8]. However, evidence from Central India remains limited, particularly regarding the simultaneous assessment of menstrual hygiene practices and psychosocial impact among school-going adolescent girls across different socioeconomic and educational settings. Furthermore, relatively few studies have employed standardized tools to evaluate psychosocial outcomes associated with menstruation.

Therefore, the present study aimed to assess menstrual hygiene practices and the psychosocial impact of menstruation among school-going adolescent girls aged 10–19 years in Indore, Madhya Pradesh, and to examine sociodemographic and menstrual factors associated with poor hygiene practices and adverse psychosocial outcomes.

1.1 Aim

To assess menstrual hygiene practices and psychosocial impact associated with menstruation among school-going adolescent girls aged 10–19 years in Indore, MP

1.2 Objectives

- To assess menstrual hygiene practices among school-going adolescent girls aged 10–19 years in Indore city.
- To assess the psychosocial impact associated with menstruation among school-going adolescent girls aged 10–19 years in Indore city.
- To identify socio demographic and menstrual factors associated with poor menstrual hygiene practices and adverse psychosocial outcomes among school-going adolescent girls.

2. MATERIALS AND METHODS

2.1 Study Design, Setting, and Population

A school-based, descriptive, cross-sectional study was conducted among school-going adolescent girls aged 10–19 years attending selected schools in Indore city, Madhya Pradesh. The study was carried out over 8 months, with data collection conducted from July 15, 2025 to October 14, 2025.

Ten schools were selected by simple random sampling from a list of eligible schools, comprising both private and government institutions

2.2 Inclusion and Exclusion Criteria

Inclusion criteria comprised school-going adolescent girls aged 10–19 years who had attained menarche, were willing to participate, and provided assent (with parental/guardian consent where

applicable). Girls who had not attained menarche, were unwilling to participate, remained absent despite a revisit, submitted incomplete questionnaires, or had known endocrine disorders, bleeding disorders, congenital reproductive tract abnormalities, or chronic systemic illness significantly affecting menstrual patterns were excluded.

2.3 Sample Size and Sampling Technique

The sample size was calculated using the formula $n = Z^2pq/d^2$, with $Z = 1.96$ (95% confidence level), $p = 48.98\%$ (prevalence of poor menstrual hygiene practice reported by Yalew *et al.*, [4]), $q = 51.02\%$, and $d = 5\%$ (absolute precision), yielding a calculated sample size of 384. After adding 10% for non-response, the final sample size was 423 participants.

Stratified systematic random sampling was employed, with schools first stratified into private and government/central strata, and sample size allocated proportionately based on the number of eligible girls in each stratum. Within each school, eligible participants were serially arranged and assigned identification numbers. With an estimated 4,234 eligible girls across selected schools, the sampling interval ($k = N/n$) was approximately 10; a random starting number between 1 and 10 was selected by the lottery method, and every 10th eligible participant was included thereafter.

2.4 Study Tool and Operational Definitions

A pre-tested, structured, self-administered questionnaire was developed after reviewing published literature and adapting validated items from the UNICEF Guidance on Menstrual Health and Hygiene [3], the Menstrual Practice Needs Scale (MPNS-36) [11], the ACOG Committee Opinion on the menstrual cycle as a vital sign [12], the NFHS-5 Woman's Questionnaire, and previous Indian studies on menstrual hygiene and psychosocial impact [5,6,8]. The questionnaire was available in English and Hindi, with the Hindi version prepared by forward translation and back-translation.

The questionnaire comprised four sections: (A) Sociodemographic factors; (B) Menstrual characteristics (menarche age, cycle regularity/length, flow duration/amount, dysmenorrhea, associated symptoms, school absenteeism); (C) Menstrual hygiene practices, scored 0–10 with one point awarded for each of ten recommended practices (Good practice defined as a composite score ≥ 6 ; Poor practice < 6); and (D) Psychosocial impact, a 12-item scale (Never=0 to Always=4; range 0–48, higher score indicating greater impact), with items reflecting embarrassment, anxiety, restriction of activities, and concentration difficulties.

2.5 Data Collection and Analysis

Following permission from school authorities and written informed assent/parental consent, the self-

administered questionnaire was distributed in a private classroom setting supervised by a trained female investigator, without teacher presence, to minimize social desirability bias. Data were entered into Microsoft Excel and analyzed using Python (pandas, SciPy, statsmodels), consistent with the descriptive and inferential approach specified in the study protocol (OpenEpi/SPSS-equivalent methods). Descriptive statistics were presented as frequencies, percentages, means, and standard deviations. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test where expected cell counts were < 5 . Crude odds ratios (OR) with 95% confidence intervals were calculated, and variables significant at $p < 0.20$ on bivariate analysis were entered into multivariable logistic regression models, with adjusted ORs and 95% CI reported. A p -value < 0.05 was considered statistically significant.

2.6 Ethical Considerations

Institutional Ethics Committee approval and school authority permission were obtained prior to data collection. Written informed assent and parental/guardian consent were obtained from all participants. Confidentiality and anonymity were maintained throughout, and participation was voluntary, with the right to withdraw at any stage without any impact on schooling.

3. RESULTS

A total of 423 school-going adolescent girls aged 10–19 years were enrolled and analyzed, meeting the calculated sample size. One data-entry value (father's education recorded as '44' for one participant) was out of the valid 1–4 range and was treated as missing for that variable only; all other variables were complete with no missing data.

3.1 Sociodemographic Characteristics

The mean age of participants was 14.63 ± 2.44 years, with the largest proportion (41.1%) in the 14–16-year age group (Table 1). Slightly more than half (52.0%) attended private schools, and the majority were Hindu by religion (63.8%). Nearly two-fifths of participants (39.2%) belonged to nuclear families, while 10.6% came from broken/single-parent families. Maternal and paternal education were relatively high, with 47.3% of mothers and 72.6% of fathers having attained higher secondary education or above. Using the Modified Kuppuswamy/BG Prasad classification, participants were fairly evenly distributed across socioeconomic strata, with the Upper Middle (28.1%) and Lower Middle (26.7%) classes most represented. Approximately two-thirds of participants (63.1%) reported having a private space at home for changing or bathing during menstruation.

Table 1: Sociodemographic Characteristics of Study Participants (N = 423)

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	10-13	144	34%
	14-16	174	41.1%
	17-19	105	24.8%
School type	Government/Central	203	48%
	Private	220	52%
Religion	Hindu	270	63.8%
	Muslim	94	22.2%
	Christian	35	8.3%
	Other	24	5.7%
Family type	Nuclear	166	39.2%
	Joint	133	31.4%
	Three-generation family	79	18.7%
	Broken/Single-parent family	45	10.6%
Mother's education	Illiterate	26	6.1%
	Primary school	67	15.8%
	Secondary school	130	30.7%
	Higher secondary & above	200	47.3%
Father's education	Illiterate	3	0.7%
	Primary school	23	5.4%
	Secondary school	89	21%
	Higher secondary & above	307	72.6%
Socioeconomic status (Modified Kuppuswamy/BG Prasad)	Upper	71	16.8%
	Upper Middle	119	28.1%
	Lower Middle	113	26.7%
	Upper Lower	82	19.4%
	Lower	38	9%
Family size	≤4 members	144	34%
	5–6 members	154	36.4%
	>6 members	125	29.6%
Private space at home for changing/bathing	Yes	267	63.1%
	No	156	36.9%

3.2 Menstrual Characteristics

The mean age at menarche was 11.85 ± 1.20 years, with the majority (49.2%) attaining menarche between 12–13 years (Table 2). Menstrual cycles were reported as regular by 48.7% of participants, while 31.7% reported irregular cycles and 19.6% were unsure. Cycle length fell within the normal range (21–35 days) for 36.6% of participants. Dysmenorrhea was reported by three-quarters of the sample, with 30.3% describing it

as severe enough to interfere with daily activities. Backache (73.8%) and premenstrual symptoms (62.2%) were the most commonly reported associated symptoms, followed by headache (47.8%) and fatigue (44.2%). Regarding school attendance, 93.6% of participants reported missing at least one school day in their last three menstrual cycles, with 23.9% missing three or more days.

Table 2: Menstrual Characteristics of Study Participants (N = 423)

Variable	Category	Frequency (n)	Percentage (%)
Age at menarche (years)	<12	184	43.5%
	12–13	208	49.2%
	≥14	31	7.3%
Cycle regularity	Regular	206	48.7%
	Irregular	134	31.7%
	Not sure	83	19.6%
Cycle length	<21 days	75	17.7%
	21–35 days	155	36.6%
	>35 days	124	29.3%
	Not sure	69	16.3%

Duration of flow	<3 days	126	29.8%
	3–7 days	193	45.6%
	>7 days	104	24.6%
Amount of flow	Scanty	80	18.9%
	Normal/Moderate	167	39.5%
	Heavy	176	41.6%
Dysmenorrhea	No	105	24.8%
	Mild (no interference)	190	44.9%
	Severe (interferes)	128	30.3%
Headache during menstruation	No	221	52.2%
	Yes	202	47.8%
Backache during menstruation	No	111	26.2%
	Yes	312	73.8%
Excessive fatigue during menstruation	No	236	55.8%
	Yes	187	44.2%
Premenstrual symptoms	No	160	37.8%
	Yes	263	62.2%
School days missed (last 3 cycles)	0 days	27	6.4%
	1–2 days	295	69.7%
	≥3 days	101	23.9%

3.3 Menstrual Hygiene Practices (Objective 1)

Item-wise analysis of hygiene practices showed that use of a recommended absorbent (sanitary pad/tampon/menstrual cup) was reported by 88.9% of participants, and access to a functional school toilet with water was reported by 86.8% (Table 3). Recommended

practice was comparatively lower for restriction of routine activities (45.9% reported no restriction) and for maintaining school attendance during menstruation (54.6% reported no absenteeism), indicating these as areas of relative concern.

Table 3: Item-wise Distribution of Menstrual Hygiene Practices (N = 423)

Practice Item	Recommended Practice n (%)	Non-recommended Practice n (%)
C1. Type of absorbent used (pad/tampon/cup vs. cloth/other)	376 (88.9%)	47 (11.1%)
C2. Frequency of changing absorbent (≥3/day vs. <3/day)	313 (74%)	110 (26%)
C3. Washing genital area with soap and water (yes vs. no)	333 (78.7%)	90 (21.3%)
C4. Frequency of genital washing (≥2–3/day vs. <2/day)	301 (71.2%)	122 (28.8%)
C5. Material used for washing (water+soap vs. water only/other)	333 (78.7%)	90 (21.3%)
C6. Daily bathing during menstruation (yes vs. no)	267 (63.1%)	156 (36.9%)
C7. Method of absorbent disposal (hygienic vs. unhygienic)	297 (70.2%)	126 (29.8%)
C8. Privacy available for changing (yes, both settings vs. no/partial)	324 (76.6%)	99 (23.4%)
C9. School absenteeism during menstruation (no vs. yes)	231 (54.6%)	192 (45.4%)
C10. Access to functional toilet with water in school (yes vs. no)	367 (86.8%)	56 (13.2%)
C11. Restriction of routine activities during menstruation (no vs. yes)	194 (45.9%)	229 (54.1%)

The overall mean menstrual hygiene practice score was 7.89 ± 1.76 out of a possible 10 (Table 4). Based on the pre-defined cut-off (score ≥6 = Good practice), the overall prevalence of good menstrual

hygiene practice in this population was 93.6% (n=396), while 6.4% (n=27) demonstrated poor practice — the primary outcome of this study.

Table 4: Overall Menstrual Hygiene Practice Score (N = 423)

Measure	Value
Mean ± SD practice score (range 0–10)	7.89 ± 1.76
Median (IQR) practice score	8 (6–9)
Good menstrual hygiene practice (score ≥6), n (%)	396 (93.6%)
Poor menstrual hygiene practice (score <6), n (%)	27 (6.4%)

3.4 Psychosocial Impact of Menstruation (Objective 2)

On item-wise analysis of the psychosocial impact scale, the highest-endorsed concerns ('Often' or

'Always') were feeling uncomfortable attending school during menstruation (50.1% combined) and hesitancy in discussing menstruation with others (53.9% combined) (Table 5). Difficulty concentrating in class was reported

‘Often’ or ‘Always’ by 50.3% of participants, and worry about leakage or staining was similarly common (47.0% combined).

Table 5: Item-wise Distribution of Psychosocial Impact of Menstruation (N = 423)

Statement	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)	Always n (%)
I feel embarrassed during menstruation.	44 (10.4%)	86 (20.3%)	89 (21%)	132 (31.2%)	72 (17%)
I feel anxious during menstruation.	52 (12.3%)	77 (18.2%)	88 (20.8%)	116 (27.4%)	90 (21.3%)
I feel stressed during menstruation.	62 (14.7%)	94 (22.2%)	91 (21.5%)	109 (25.8%)	67 (15.8%)
I become irritable during menstruation.	45 (10.6%)	67 (15.8%)	97 (22.9%)	113 (26.7%)	101 (23.9%)
I experience mood changes during menstruation.	67 (15.8%)	90 (21.3%)	82 (19.4%)	105 (24.8%)	79 (18.7%)
I avoid social activities during menstruation.	56 (13.2%)	78 (18.4%)	89 (21%)	125 (29.6%)	75 (17.7%)
I restrict my routine activities during menstruation.	52 (12.3%)	75 (17.7%)	88 (20.8%)	105 (24.8%)	103 (24.3%)
I avoid participating in sports or physical activities during menstruation.	71 (16.8%)	63 (14.9%)	99 (23.4%)	102 (24.1%)	88 (20.8%)
I have difficulty concentrating in class during menstruation.	58 (13.7%)	72 (17%)	80 (18.9%)	102 (24.1%)	111 (26.2%)
I worry about leakage or staining during menstruation.	34 (8%)	80 (18.9%)	110 (26%)	99 (23.4%)	100 (23.6%)
I feel uncomfortable attending school during menstruation.	36 (8.5%)	56 (13.2%)	119 (28.1%)	134 (31.7%)	78 (18.4%)
I feel hesitant discussing menstruation with others.	46 (10.9%)	55 (13%)	94 (22.2%)	137 (32.4%)	91 (21.5%)

The mean psychosocial impact score was 27.19 $\pm$ 5.15 out of a possible 48, with a median of 27 (IQR 23.5–31) (Table 6). Using the 75th percentile (score >31) as the cut-off for logistic regression analysis, 23.6%

(n=100) of participants were classified as experiencing a high psychosocial impact, while 76.4% (n=323) were classified as not high.

Table 6: Summary of Psychosocial Impact Score (N = 423)

Measure	Value
Mean $\pm$ SD psychosocial impact score (range 0–48)	27.19 $\pm$ 5.15
Median (IQR) psychosocial impact score	27 (23.5–31)
75th percentile (P75) cut-off value	31
High psychosocial impact (score > P75), n (%)	100 (23.6%)
Not high psychosocial impact (score $\leq$ P75), n (%)	323 (76.4%)

3.5 Factors Associated with Menstrual Hygiene Practice (Objective 3)

On bivariate analysis, none of the sociodemographic factors examined — age group, school type, religion, family type, parental education,

socioeconomic status, family size, or availability of private space at home — showed a statistically significant association with menstrual hygiene practice category (all $p > 0.05$; Table 7).

Table 7: Association Between Sociodemographic Factors and Menstrual Hygiene Practice (Good vs. Poor)

Variable	Category	Good Practice n (%)	Poor Practice n (%)	Crude OR (95% CI)	p-value
Age group	10-13	131 (91%)	13 (9%)	Reference	0.260
	14-16	166 (95.4%)	8 (4.6%)	—	
	17-19	99 (94.3%)	6 (5.7%)	—	
School type	Government/Central	191 (94.1%)	12 (5.9%)	Reference	0.703

	Private	205 (93.2%)	15 (6.8%)	0.86 (0.39–1.88)	
Religion	Christian	31 (88.6%)	4 (11.4%)	Reference	0.619
	Hindu	254 (94.1%)	16 (5.9%)	—	
	Muslim	88 (93.6%)	6 (6.4%)	—	
	Other	23 (95.8%)	1 (4.2%)	—	
Family type	Broken/Single-parent	41 (91.1%)	4 (8.9%)	Reference	0.857
	Joint	126 (94.7%)	7 (5.3%)	—	
	Nuclear	155 (93.4%)	11 (6.6%)	—	
	Three-generation	74 (93.7%)	5 (6.3%)	—	
Mother edu	Illiterate/Primary	85 (91.4%)	8 (8.6%)	Reference	0.322
	Secondary & above	311 (94.2%)	19 (5.8%)	1.54 (0.65–3.64)	
Father edu	Illiterate/Primary	24 (92.3%)	2 (7.7%)	Reference	0.678
	Secondary & above	371 (93.7%)	25 (6.3%)	1.24 (0.28–5.53)	
SES	Lower Middle/Upper Lower/Lower	221 (94.8%)	12 (5.2%)	Reference	0.251
	Upper/Upper Middle	175 (92.1%)	15 (7.9%)	0.63 (0.29–1.39)	
Family size	<=4	134 (93.1%)	10 (6.9%)	Reference	0.734
	>4	262 (93.9%)	17 (6.1%)	1.15 (0.51–2.58)	
Privacy home	No	146 (93.6%)	10 (6.4%)	Reference	0.986
	Yes	250 (93.6%)	17 (6.4%)	1.01 (0.45–2.26)	

OR = odds ratio (vs. reference category, listed first); CI = confidence interval. *p*-values from Chi-square test (Fisher's exact test used where expected cell count <5). * indicates *p*<0.05. OR shown only for two-category comparisons.

Similarly, none of the menstrual characteristics examined, including age at menarche, cycle regularity, flow duration and amount, dysmenorrhea, or associated symptoms, reached statistical significance (all *p*>0.05;

Table 8), though premenstrual symptoms approached the pre-specified screening threshold (*p*=0.120) and was therefore entered into the multivariable model.

Table 8: Association Between Menstrual Factors and Menstrual Hygiene Practice (Good vs. Poor)

Variable	Category	Good Practice n (%)	Poor Practice n (%)	Crude OR (95% CI)	p-value
Menarche age	<12	173 (94%)	11 (6%)	Reference	0.765
	>=12	223 (93.3%)	16 (6.7%)	0.89 (0.4–1.96)	
Cycle regularity	Irregular/Not sure	200 (92.2%)	17 (7.8%)	Reference	0.210
	Regular	196 (95.1%)	10 (4.9%)	1.67 (0.74–3.73)	
Flow duration	<3 days	119 (94.4%)	7 (5.6%)	Reference	0.650
	>=3 days	277 (93.3%)	20 (6.7%)	0.81 (0.34–1.98)	
Flow amount	Heavy	163 (92.6%)	13 (7.4%)	Reference	0.476
	Scanty/Normal	233 (94.3%)	14 (5.7%)	1.33 (0.61–2.9)	
Dysmenorrhea	No/Mild	274 (92.9%)	21 (7.1%)	Reference	0.347
	Severe	122 (95.3%)	6 (4.7%)	1.56 (0.61–3.96)	
Headache	No	206 (93.2%)	15 (6.8%)	Reference	0.722
	Yes	190 (94.1%)	12 (5.9%)	1.15 (0.53–2.53)	
Backache	No	104 (93.7%)	7 (6.3%)	Reference	0.969
	Yes	292 (93.6%)	20 (6.4%)	0.98 (0.4–2.39)	
Fatigue	No	221 (93.6%)	15 (6.4%)	Reference	0.980
	Yes	175 (93.6%)	12 (6.4%)	0.99 (0.45–2.17)	
PMS	No	146 (91.2%)	14 (8.8%)	Reference	0.120
	Yes	250 (95.1%)	13 (4.9%)	1.84 (0.84–4.03)	

OR = odds ratio (vs. reference category, listed first); CI = confidence interval. *p*-values from Chi-square test (Fisher's exact test used where expected cell count <5). * indicates *p*<0.05. OR shown only for two-category comparisons.

On multivariable logistic regression, presence of premenstrual symptoms was not an independent

predictor of poor menstrual hygiene practice (adjusted OR 0.54, 95% CI 0.25–1.19, *p*=0.125) (Table 9).

Table 9: Multivariable Logistic Regression: Independent Predictors of Poor Menstrual Hygiene Practice

Variable	Adjusted OR	95% CI	p-value
Premenstrual symptoms (PMS) present (Yes vs. No)	0.54	0.25–1.19	0.125

Only variable meeting $p < 0.20$ inclusion criterion on bivariate analysis (Tables 7 & 8); model reduces to a single-predictor logistic regression. No variable reached statistical significance ($p < 0.05$) as an independent predictor of poor menstrual hygiene practice in this sample.

3.6 Factors Associated with Psychosocial Impact (Objective 3)

On bivariate analysis, none of the sociodemographic or menstrual factors examined showed a statistically significant association with high

psychosocial impact (all $p > 0.05$; Table 10). Cycle regularity approached the pre-specified screening threshold ($p = 0.095$) and was entered into the multivariable model.

Table 10: Association Between Sociodemographic/Menstrual Factors and Psychosocial Impact (High vs. Not High)

Variable	Category	High Impact n (%)	Not High Impact n (%)	Crude OR (95% CI)	p-value
Age group	10-13	31 (21.5%)	113 (78.5%)	Reference	0.269
	14-16	48 (27.6%)	126 (72.4%)	—	
	17-19	21 (20%)	84 (80%)	—	
School type	Government/Central	45 (22.2%)	158 (77.8%)	Reference	0.493
	Private	55 (25%)	165 (75%)	1.17 (0.75–1.84)	
Family type	Joint/Three-gen/Broken-Single	63 (24.5%)	194 (75.5%)	Reference	0.599
	Nuclear	37 (22.3%)	129 (77.7%)	0.88 (0.56–1.4)	
SES	Lower Middle/Upper Lower/Lower	54 (23.2%)	179 (76.8%)	Reference	0.803
	Upper/Upper Middle	46 (24.2%)	144 (75.8%)	1.06 (0.67–1.66)	
Menarche age	<12	39 (21.2%)	145 (78.8%)	Reference	0.299
	≥12	61 (25.5%)	178 (74.5%)	1.27 (0.81–2.01)	
Dysmenorrhea	No/Mild	73 (24.7%)	222 (75.3%)	Reference	0.417
	Severe	27 (21.1%)	101 (78.9%)	0.81 (0.49–1.34)	
Cycle regularity	Irregular/Not sure	44 (20.3%)	173 (79.7%)	Reference	0.095
	Regular	56 (27.2%)	150 (72.8%)	1.47 (0.93–2.31)	
Flow amount	Heavy	38 (21.6%)	138 (78.4%)	Reference	0.402
	Scanty/Normal	62 (25.1%)	185 (74.9%)	1.22 (0.77–1.93)	

OR = odds ratio (vs. reference category, listed first); CI = confidence interval. p -values from Chi-square test (Fisher's exact test used where expected cell count < 5). * indicates $p < 0.05$. OR shown only for two-category comparisons.

On adjusted analysis, having a regular menstrual cycle was not an independent predictor of high

psychosocial impact (adjusted OR 1.47, 95% CI 0.93–2.31, $p = 0.096$) (Table 11).

Table 11: Multivariable Logistic Regression: Independent Predictors of High Psychosocial Impact

Variable	Adjusted OR	95% CI	p-value
Regular menstrual cycle (Regular vs. Irregular/Not sure)	1.47	0.93–2.31	0.096

Only variable meeting $p < 0.20$ inclusion criterion on bivariate analysis (Table 10); model reduces to a single-predictor logistic regression. No variable reached statistical significance ($p < 0.05$) as an independent predictor of high psychosocial impact in this sample.

4. DISCUSSION

This cross-sectional study assessed menstrual hygiene practices and the psychosocial impact of menstruation among 423 school-going adolescent girls aged 10–19 years in Indore, Madhya Pradesh. The overall prevalence of good menstrual hygiene practice was high, at 93.6%, with a mean practice score of 7.89 ± 1.76 out of 10. Approximately one in four participants (23.6%) was classified as experiencing a high

psychosocial impact of menstruation. On bivariate and multivariable analysis, none of the sociodemographic or menstrual factors examined showed a statistically significant independent association with either outcome.

4.1 Menstrual Hygiene Practice

The prevalence of good menstrual hygiene practice observed in this study (93.6%) was considerably higher than the pooled estimate used to power this study's sample size, in which Yalew *et al.*, reported that

nearly half of adolescent girls in Ethiopia practiced poor menstrual hygiene (poor practice prevalence 48.98%), with inadequate knowledge identified as a major determinant [4]. The present findings are also considerably more favourable than those reported by Ganguly *et al.*, among rural school-going adolescent girls in Bankura, West Bengal, with a specific focus on the Kora tribal population, where the large majority of respondents had no prior understanding of menstruation, the use of homemade reusable cloth predominated over commercial absorbents, and unhygienic disposal practices were common [7]. A similar pattern was seen in the tribal residential-school population studied by Borkar *et al.*, in Nagpur district, Central India, where less than half of participants were aware of menarche before its onset, although menstrual cycle regularity and duration in that tribal cohort were reported at high levels broadly comparable to the present urban sample [8]. Read together, this pattern suggests a rural–urban and tribal–non-tribal gradient in menstrual hygiene practice within Central India: the present study’s urban, school-going, and comparatively better-resourced population (private-school attendance in 52.0% of participants, higher secondary or above paternal education in 72.6%) appears to enjoy considerably better access to hygienic absorbents, water, and private changing facilities than the rural and tribal populations described in these comparator studies.

This interpretation is consistent with the wider systematic review and meta-analysis by Van Eijk *et al.*, which pooled data from 138 studies across India and documented substantial regional and rural–urban heterogeneity in menstrual hygiene indicators; that review reported a pooled prevalence of school absenteeism during menstruation of approximately 24% and toilet availability at home in only about half of adolescent girls nationally [5]. By comparison, school absenteeism specifically during the last menstrual period was reported by 45.4% of participants in the present study (i.e., recommended non-absenteeism practice, item C9, was present in only 54.6%), a notably higher proportion than the national pooled estimate, even though overall practice scores were favourable. This suggests that despite good hygiene practice on most individual items, school absenteeism and restriction of routine activities (recommended practice present in only 45.9% for item C11) remain the two weakest components of menstrual hygiene management in this population, and would benefit from targeted school-based intervention even in a setting where overall practice appears favourable.

The absence of a statistically significant association between any sociodemographic or menstrual factor and menstrual hygiene practice category in this study contrasts with several prior Indian studies, including Van Eijk *et al.*, [5] and Ganguly *et al.*, [7], which identified parental education, family income, and rural/tribal residence as significant determinants of

practice. A plausible explanation is a ceiling effect: with 93.6% of the present sample already classified as ‘Good’ practice, there was very limited variation left in the outcome (only 27 girls with ‘Poor’ practice) for any bivariate association to be statistically detectable, even if a true underlying relationship exists. The relatively homogeneous urban, school-going sampling frame — which by design excluded out-of-school girls who are frequently the population in which the sharpest sociodemographic disparities in menstrual hygiene are observed — may also have narrowed the range of exposure across the sociodemographic variables examined.

4.2 Psychosocial Impact of Menstruation

Nearly one-quarter (23.6%) of participants in this study were classified as experiencing a high psychosocial impact of menstruation, with the highest-endorsed concerns being discomfort attending school, hesitancy discussing menstruation with others, and difficulty concentrating in class. This is broadly consistent with the qualitative metasynthesis by Hennegan *et al.*, which found that embarrassment, shame, secrecy, and restriction were recurring and widespread themes in women’s and girls’ menstrual experiences across low- and middle-income countries [1]. It also aligns with the descriptive findings of Sundari *et al.*, who similarly documented psychosocial problems — including emotional disturbance, activity restriction, and social discomfort — among a sample of adolescent girls in Chennai, Tamil Nadu, using a comparable descriptive cross-sectional approach [6]. Taken together with the present findings, this supports the observation that psychosocial impact and hygiene practice are not simply two faces of the same underlying construct: a girl may practice good physical hygiene while still experiencing considerable embarrassment, anxiety, or social restriction around menstruation, underscoring UNICEF’s position that menstrual health should be addressed as a matter of dignity and psychosocial wellbeing, not hygiene logistics alone [3].

As with menstrual hygiene practice, none of the sociodemographic or menstrual factors examined were independently associated with high psychosocial impact in this study, though cycle regularity approached the pre-specified screening threshold ($p=0.095$) without reaching significance on adjusted analysis (adjusted OR 1.47, 95% CI 0.93–2.31, $p=0.096$). This null finding should be interpreted cautiously rather than as evidence that no such association exists: with only 100 of 423 participants (23.6%) classified as ‘High impact’ by design (the P75 cut-off necessarily assigns roughly a quarter of any sample to this category), the subgroup available for bivariate comparison was comparatively small, and the study may have been underpowered to detect associations with weaker or more diffuse psychosocial outcomes than with the more skewed practice-score outcome.

4.3 Strengths

This study benefited from a calculated sample size derived from a published meta-analysis [4], a stratified systematic random sampling technique across both government and private schools, and questionnaire items adapted from internationally validated tools, including the UNICEF MHM-in-Ten toolkit [3], the ACOG Committee Opinion on the menstrual cycle as a vital sign [12], and the Menstrual Practice Needs Scale (MPNS-36) [11], supporting comparability with other studies using these instruments. Pre-defined, transparent scoring criteria for both outcomes, along with a pre-registered data-quality plan, further strengthen the internal validity of the findings.

4.4 Limitations

As a cross-sectional study, causal relationships between sociodemographic or menstrual factors and either outcome cannot be established. Findings are based on self-reported data collected in a classroom setting and may be subject to recall and social desirability bias, despite efforts to mitigate these through anonymous, private, teacher-free administration. The study was restricted to school-going adolescent girls in urban Indore and therefore may not be generalizable to out-of-school adolescent girls, or to rural and tribal populations in the surrounding region, where considerably poorer practice has been documented [7,8]. The high overall prevalence of good practice (93.6%) limited statistical power to detect associations with hygiene practice; a larger sample, or a sampling frame deliberately including lower-resource or out-of-school populations, may be needed to detect the sociodemographic gradients reported elsewhere in the literature [5,7].

4.5 Public Health Implications

Despite generally favourable menstrual hygiene practice, school absenteeism and restriction of routine activities remain common in this population, and nearly one-quarter of participants experience a high psychosocial impact of menstruation. These findings support continued investment in school-based menstrual health programmes that address the psychosocial and dignity-related dimensions of menstruation — embarrassment, secrecy, and restriction — alongside the hygiene and infrastructure-focused interventions that have traditionally been prioritized [3]. Given the null findings on sociodemographic predictors in this comparatively well-resourced urban sample, future research in this region may benefit from deliberately sampling across a wider range of socioeconomic and rural/urban settings, and by combining quantitative psychosocial scales with qualitative approaches to better capture the lived experience of menstrual restriction and stigma described in the broader literature [1,6].

5. CONCLUSION

Among school-going adolescent girls aged 10–19 years in urban Indore, menstrual hygiene practice was

largely good, but school absenteeism, activity restriction, and psychosocial impact of menstruation remain meaningful concerns for a substantial minority. No sociodemographic or menstrual factor was independently associated with either outcome in this sample, suggesting a need for larger, more heterogeneous samples — including rural, tribal, and out-of-school populations — to identify the determinants of menstrual hygiene and psychosocial wellbeing that have been documented elsewhere in India [5,7,8].

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