

Menstrual pattern among adolescent girls at Khulna government model school and college, Khulna, Bangladesh

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ARTICLE INFO

Article history

Received: 12 August 2026

Accepted: 11 October 2026

Published: 17 October 2026

Keywords

Adolescent girls, menstruation, menstrual pattern, menstrual hygiene, dysmenorrhea, Bangladesh

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ABSTRACT

Menstruation is an important indicator of reproductive health, but menstrual irregularities and related symptoms may affect adolescents' daily activities, school participation, and well-being. Evidence on menstrual patterns among school-going adolescent girls in Khulna, Bangladesh, is limited. To assess the menstrual pattern among adolescent girls attending Khulna Government Model School and College, Khulna, Bangladesh. A descriptive cross-sectional study was conducted from January to December 2025 among 206 menstruating adolescent girls aged 11–19 years. Participants were selected using purposive sampling. Data were collected through face-to-face interviews using a pre-tested structured questionnaire and analyzed using SPSS version 26. The mean age of participants was 15.5 years, and 63.1% experienced menarche at 11–12 years. A cycle length of 21–35 days was reported by 90.0% of participants. Overall, 30.1% had a regular, 64.6% an occasionally irregular, and 5.3% an irregular menstrual pattern (mean score: 72.4%). Menstrual symptoms and pain were reported by 71.4% and 60.7%, respectively. Disposable sanitary pads were used by 69.9%, while 97.6% reported regular genital hygiene. Difficulties maintaining menstrual hygiene at school were reported by 28.2%, and menstruation affected daily activities in 64.1%. Cultural or family restrictions were reported by 83.5%. Occasional menstrual irregularity and menstrual-related symptoms were common among the participants. Strengthening school-based menstrual health education, supportive environments, and adequate menstrual hygiene facilities may improve menstrual health among adolescent girls.

1. Introduction

Adolescence is a critical developmental stage between childhood and adulthood, characterized by rapid physical, psychological, cognitive, and social changes. The World Health Organization (WHO) defines adolescence as the period from 10 to 19 years of age. This period is particularly important for establishing foundations for lifelong health, including sexual and reproductive health. Menarche, the first menstrual period, represents a major milestone of female reproductive maturation and may be influenced by biological, nutritional, socioeconomic, and environmental factors (WHO, 2024a; WHO, 2024b).

Menstrual health is an integral component of adolescent health and well-being. It encompasses physical, mental, and social well-being in relation to the menstrual cycle and requires access to accurate information, appropriate menstrual materials, adequate water and sanitation facilities, supportive health services, and an environment free from stigma and discrimination (Hennegan et al., 2021). Assessment of menstrual health during adolescence can therefore provide important information about reproductive health and facilitate

the early recognition of menstrual disorders and other health concerns.

Menstrual patterns are commonly assessed according to cycle interval, regularity, duration of bleeding, and menstrual symptoms. Considerable variation may occur during the first years following menarche because maturation of the hypothalamic–pituitary–ovarian axis may result in anovulatory and irregular cycles (ACOG, 2015). However, persistent or marked abnormalities, such as cycles occurring more frequently than every 21 days or less frequently than every 45 days, bleeding lasting more than 7 days, or unusually heavy bleeding, may warrant clinical evaluation (ACOG, 2015; Munro et al., 2018). Monitoring menstrual characteristics during adolescence is therefore important for distinguishing physiological variation from potentially abnormal menstrual patterns.

Menstrual symptoms, particularly dysmenorrhea, are common during adolescence and may adversely affect physical, psychological, and social well-being. Menstrual pain may be accompanied by headache, nausea, vomiting, dizziness, backache, and gastrointestinal symptoms and can interfere with routine activities and school participation (El-

Gilany et al., 2005; Yesuf et al., 2018). Evidence from Bangladesh also indicates that menstrual problems are common among school-going adolescent girls. A school-based study conducted in Dhaka reported dysmenorrhea as the most frequently reported menstrual problem among adolescent girls (Alam et al., 2022). Similar studies have documented variations in menstrual characteristics and menstrual-related problems among adolescent girls in different settings (Rigon et al., 2012; Sharma et al., 2016).

Menstrual hygiene management is another important component of adolescent menstrual health. Appropriate menstrual hygiene requires access to suitable absorbent materials, adequate facilities for changing and cleaning, water and sanitation, appropriate genital hygiene, and safe disposal of used menstrual materials (Hennegan et al., 2021). Evidence from Bangladesh has demonstrated considerable variation in menstrual hygiene practices among adolescent girls. A study conducted among adolescent schoolgirls in the Rajshahi division found substantial differences in menstrual hygiene practices between urban and rural settings and reported limited continuous use of sanitary pads among some participants (Alam et al., 2022). In addition, menstrual hygiene management has been associated with school attendance and the ability of adolescent girls to participate fully in educational activities (Alam et al., 2017).

The school environment is particularly important because inadequate privacy, sanitation facilities, water supply, disposal systems, and access to menstrual materials may create difficulties for girls during menstruation. Sociocultural beliefs and restrictions may further influence menstrual experiences and school participation. A national study among Bangladeshi schoolgirls found that menstruation-related school absenteeism was associated with menstrual hygiene management and social restrictions (Alam et al., 2017). Conversely, school-based menstrual health education has been shown to improve menstrual knowledge and practices and may contribute to reducing menstrual-related restrictions and problems among adolescent girls (Haque et al., 2014).

The need for context-specific evidence is particularly relevant in Khulna. The Adolescent Menstrual Experiences and Health Cohort (AMEHC) study was established in Khulna to

investigate menstrual health and its relationships with adolescent girls' health and educational outcomes, involving girls from numerous schools in the region (Hennegan et al., 2024). Although this study provides important evidence on menstrual health in Khulna, school-specific descriptive information regarding menstrual patterns, symptoms, hygiene practices, and sociocultural restrictions remains valuable for informing local school health and nursing interventions.

Therefore, the present study was conducted to assess the menstrual pattern among adolescent girls attending Khulna Government Model School and College, Khulna, Bangladesh, with particular attention to menstrual characteristics, associated symptoms, menstrual hygiene practices, and menstrual-related restrictions. The findings may provide locally relevant evidence to support school-based menstrual health education, early identification of menstrual problems, and appropriate nursing and health-promotion interventions.

2. Materials and methods

2.1. Study design and population

A descriptive cross-sectional study was conducted among adolescent girls at Khulna Government Model School and College, Khulna, Bangladesh. The study was conducted during January–December 2025. The study population consisted of adolescent girls aged 11–19 years studying at Khulna Government Model School and College who had attained menarche.

2.2. Sample size and sampling

The eligible population of adolescent girls aged 11–19 years who had attained menarche at the study institution was reported to be 426. The sample size was estimated using the Taro Yamane formula:

$$n = N / [1 + N(e^2)]$$

where n is the required sample size, N is the eligible population, and e is the level of precision. With $N = 426$ and $e = 0.05$, the calculated sample size was approximately 206 participants. Accordingly, 206 eligible adolescent girls were included in the study.

Participants were selected using a non-probability purposive sampling technique. Eligible girls who met the inclusion criteria and were willing to participate were recruited until the required sample size was reached. Because purposive sampling was used rather than probability-based sampling, the calculated precision should be regarded as a sample-size estimation criterion rather than a statistically guaranteed 5% margin of sampling error. The sampling procedure was not designed to produce a probability-representative sample of adolescent girls in Khulna or Bangladesh.

2.3. Eligibility criteria

Inclusion criteria-

Participants were included if they:

- were aged 11-19 years;
- had attained menarche; and
- were willing to participate.

Exclusion criteria-

Girls were excluded if they:

- had primary amenorrhea; or
- could not recall the date of menarche or menstruation.

2.4. Data collection instrument

Data were collected through face-to-face interviews using a structured questionnaire. The questionnaire covered socio-demographic characteristics, age at menarche, menstrual cycle characteristics, duration of bleeding, menstrual symptoms, pain, absorbent use, hygiene practices, menstrual education, effects on daily activities, and cultural or family restrictions.

The instrument was reviewed by two nursing experts from Khulna Nursing College to assess content validity. It was subsequently pre-tested among 20 students 10 from the junior section and 10 from the senior section to assess clarity and suitability. Necessary modifications were made before final data collection.

2.5. Measurement of menstrual pattern

Menstrual pattern was assessed using a composite scoring approach based on selected questionnaire items related to menstrual characteristics and experiences. The relevant items were scored according to the response categories specified in the study questionnaire, and the individual item

scores were combined to obtain an overall menstrual-pattern score, which was expressed as a percentage. The scoring system was developed for the present study based on the predefined questionnaire items and was not derived from a previously validated standardized menstrual-pattern instrument.

Participants were classified according to their composite score as follows: regular menstrual pattern (80-100%), occasionally irregular menstrual pattern (60-79%), and irregular menstrual pattern (<60%). The mean composite menstrual-pattern score was calculated for the study population.

The composite score was intended to provide an overall summary of menstrual characteristics rather than to represent cycle length alone. Therefore, cycle length (e.g., 21-35 days) and the overall menstrual-pattern classification were treated as separate measures. A cycle length within the commonly reported 21-35-day range did not necessarily result in classification as a regular menstrual pattern because the composite classification incorporated multiple questionnaire items.

Because the composite scoring system was developed for this study, it should be considered a study-specific descriptive measure rather than a validated clinical scale. The questionnaire items, response scoring, weighting, and calculation of the composite score should be reported in a supplementary table to facilitate reproducibility. Participants with missing responses were handled according to the predetermined scoring procedure used during data processing.

2.6. Data collection and analysis

Data were collected after obtaining the necessary administrative and ethical permissions. Completed questionnaires were checked for completeness and consistency before data entry. The data were coded and analyzed using SPSS version 26. Descriptive statistics, including frequencies, percentages, and measures of central tendency where appropriate, were used to summarize the socio-demographic characteristics, menstrual characteristics, menstrual hygiene practices, information sources, and sociocultural factors of the participants. The findings are presented using tables and narrative descriptions.

2.7. Ethical considerations

Ethical clearance was obtained from the Institutional Review Board of Khulna Nursing College, Khulna (Approval No Need). Administrative permission was obtained from the relevant authorities. Participants were informed about the purpose and implications of the study, and participation was voluntary. Confidentiality was maintained, participants were informed of their right to withdraw, and no invasive procedures were involved.

3. Results

A total of 206 adolescent girls who had attained menarche participated in the study. The mean age of the participants was 15.5 years. The largest proportion were aged 15–16 years (34.5%), followed by 17–18 years (23.3%), 13–14 years (22.3%), >18 years (14.1%), and 11–12 years (5.8%). Regarding educational level, 43.2% were studying in classes 11–12, followed by class 10 (24.3%), classes 6–7 (15.5%), class 8 (11.2%), and class 9 (5.8%). Business was the most commonly reported source of family income (37.9%), followed by employment (20.4%), farming (17.5%), expatriate income (10.7%), and other sources (13.6%).

The reported age at menarche ranged from 8 to 14 years. Most participants experienced menarche at 11–12 years (63.1%), followed by 13–14 years (31.1%) and 8–10 years (5.8%). Based on the reported menstrual cycle pattern, 76.2% of participants had a regular cycle of 21–35 days, 23.3% reported occasional irregularity, and 0.5% reported frequent irregularity. When cycle length was considered separately, 90.0% reported cycles of 21–35 days, 9.0% reported cycles longer than 35 days, and 1.0% reported cycles shorter than 21 days. Blood clots during menstruation were reported by 48.1% of participants, while 51.9% reported no blood clots. Intermenstrual spotting was reported by 11.7% of participants. Overall, 71.4% reported one or more symptoms before or during menstruation, and 60.7% reported menstrual pain.

Regarding menstrual hygiene practices, disposable sanitary pads were the most commonly used absorbent (69.9%), followed by tissue (13.6%), reusable cloth (13.1%), and tampons (3.4%). Most participants reported changing their menstrual absorbent four times per day (58.3%), followed by

three times (19.9%), five times (19.4%), and twice (2.4%). Regular genital hygiene was reported by 97.6% of participants, while 86.9% reported having received menstrual hygiene education. However, 28.2% reported experiencing problems maintaining menstrual hygiene at school.

Before menarche, 17.0% of participants reported being well informed about menstruation, 76.2% were somewhat informed, and 6.8% were not informed. The mother was the most commonly reported source of information (55.8%), followed by sisters (19.4%), teachers (13.1%), friends (10.2%), and other sources (1.5%). Menstruation was reported to affect daily activities among 64.1% of participants, whereas 35.9% reported no effect. Cultural or family restrictions related to menstruation were reported by 83.5% of participants.

Based on the study-specific composite menstrual-pattern assessment, 62 participants (30.1%) were classified as having a regular menstrual pattern, 133 (64.6%) as having an occasionally irregular pattern, and 11 (5.3%) as having an irregular pattern. The mean composite menstrual-pattern score was 72.4%, corresponding to the occasionally irregular category. The composite classification was distinct from cycle length alone: although 90.0% of participants reported a cycle length of 21–35 days, cycle length represented only one menstrual characteristic and was therefore not equivalent to the overall composite menstrual-pattern classification. Detailed socio-demographic, menstrual, hygiene, information, and sociocultural characteristics are presented in Table 1.

Table 1. Socio-demographic, menstrual, hygiene, and sociocultural characteristics of adolescent girls (n = 206)

Variable	Category	n	%
Age (years)	11–12	12	5.8
	13–14	46	22.3
	15–16	71	34.5
	17–18	48	23.3
	>18	29	14.1
Class	6–7	32	15.5
	8	23	11.2
	9	12	5.8
	10	50	24.3
	11–12	89	43.2
Family income source	Business	78	37.9
	Employment	42	20.4
	Farming	36	17.5
	Expatriate	22	10.7

	Other	28	13.6
Age at menarche (years)	8–10	12	5.8
	11–12	130	63.1
	13–14	64	31.1
Menstrual cycle pattern	Regular (21–35 days)	157	76.2
	Occasionally irregular	48	23.3
	Frequently irregular	1	0.5
Cycle length	<21 days	2	1.0
	21–35 days	185	90.0
	>35 days	19	9.0
Blood clots	Yes	99	48.1
	No	107	51.9
Intermenstrual spotting	Yes	24	11.7
	No	182	88.3
Symptoms before/during menstruation	Yes	147	71.4
	No	59	28.6
Menstrual pain	Yes	125	60.7
	No	81	39.3
Absorbent used	Disposable pad	144	69.9
	Reusable cloth	27	13.1
	Tissue	28	13.6
	Tampon	7	3.4
Absorbent change/day	2 times	5	2.4
	3 times	41	19.9
	4 times	120	58.3
	5 times	40	19.4
Regular genital hygiene	Yes	201	97.6
	No	5	2.4
Menstrual hygiene education	Yes	179	86.9
	No	27	13.1
Problems maintaining hygiene at school	Yes	58	28.2
	No	148	71.8
Familiarity before menarche	Well informed	35	17.0
	Somewhat informed	157	76.2
	Not informed	14	6.8
Information source before menarche	Mother	115	55.8
	Sister	40	19.4
	Teacher	27	13.1
	Friend	21	10.2
	Other	3	1.5
Effect on daily activities	Yes	132	64.1
	No	74	35.9
Cultural/family restrictions	Yes	172	83.5
	No	34	16.5

Overall menstrual pattern	Regular	62	30.1
	Occasionally irregular	133	64.6
	Irregular	11	5.3

Note: The overall menstrual-pattern classification was based on the study-specific composite scoring system described in the Methods. The composite classification should not be interpreted as equivalent to cycle length alone

4. Discussion

The present study assessed menstrual characteristics, hygiene practices, menstrual health information, and sociocultural experiences among 206 adolescent girls attending Khulna Government Model School and College. The mean age of participants was 15.5 years, with the largest proportion aged 15–16 years. Most participants were students of classes 11–12. These characteristics indicate that the study population predominantly comprised mid- to late-adolescent schoolgirls, an age group in which menstrual health knowledge, practices, and experiences are particularly relevant to school participation and well-being.

In the present study, 63.1% of participants reported menarche at 11–12 years, while 31.1% reported menarche at 13–14 years. This distribution is broadly consistent with evidence that age at menarche varies according to population and socioeconomic context. A cross-sectional study among urban female students in Bangladesh reported a median age at menarche of 12 years, although the reported mean was 11.6 ± 3.6 years (Islam et al., 2017). Earlier Bangladeshi research in a rural population reported a higher mean age at menarche of approximately 13 years (Hossain et al., 2000; Chowdhury et al., 2000). Differences between studies may reflect variation in geographical setting, participant characteristics, nutritional status, socioeconomic conditions, and methods used to ascertain age at menarche. Therefore, the present findings should be interpreted in relation to the characteristics of the study population rather than as representative of Bangladeshi adolescents generally.

Most participants in this study reported a menstrual cycle length of 21–35 days (90.0%). However, the

study-specific composite assessment classified only 30.1% as having a regular menstrual pattern, whereas 64.6% were classified as occasionally irregular and 5.3% as irregular. This apparent difference is important because cycle length and the overall menstrual-pattern score represent different constructs. Cycle length describes the interval between menstrual periods, whereas the composite assessment incorporated multiple predefined questionnaire characteristics. Consequently, a participant could report a cycle length within the 21–35-day range but still obtain a lower overall composite score because of other menstrual characteristics. The distinction should therefore be maintained when interpreting the findings.

The prevalence of menstrual irregularity in the present study also differs from findings reported in other adolescent populations. In a cross-sectional study of 260 adolescent girls in Pokhara Valley, Nepal, 64.2% reported irregular menstrual cycles, while 74.2% reported cycle lengths between 21 and 35 days (Shrestha et al., 2016). The coexistence of a substantial proportion of girls with a cycle length within the 21–35-day range and a higher proportion classified as having irregular cycles in that study further illustrates that menstrual regularity cannot necessarily be characterized by cycle length alone. Differences in definitions, populations, and assessment methods should be considered when comparing menstrual-pattern estimates across studies.

Menstrual symptoms were common in the present study, with 71.4% of participants reporting one or more symptoms before or during menstruation and 60.7% reporting menstrual pain. Similar concerns have been documented among adolescent girls in other settings. In the Pokhara Valley study, dysmenorrhoea was reported by 71.5% of participants and was identified as an important menstrual problem affecting school attendance (Shrestha et al., 2016). A school-based study in Dhaka, Bangladesh, also reported a high prevalence of menstrual problems, with dysmenorrhoea reported by 78.4% of participants

(Alam et al., 2022; Islam et al., 2017). However, the present study measured self-reported menstrual pain rather than applying a clinical definition or severity scale for dysmenorrhoea. Therefore, the 60.7% prevalence of menstrual pain should not be interpreted as the prevalence of clinically diagnosed dysmenorrhoea.

Menstrual hygiene practices were generally reported to be favorable in this study. Disposable sanitary pads were the most frequently used absorbent (69.9%), and 97.6% of participants reported regular genital hygiene. In addition, 86.9% reported having received menstrual hygiene education. These findings are relevant because menstrual health depends not only on individual knowledge but also on access to appropriate materials, water, sanitation, privacy, and supportive environments. Research among Bangladeshi adolescent schoolgirls has demonstrated that inadequate facilities and support can create difficulties in managing menstruation at school (Alam et al., 2017). Thus, the relatively high prevalence of reported hygiene practices in the present study should not be interpreted as indicating that menstrual health needs have been fully addressed.

Despite the generally favorable reported hygiene practices, 28.2% of participants experienced difficulties maintaining menstrual hygiene at school. This finding highlights the distinction between individual practices and the enabling environment in which menstruation is managed. Previous research in Bangladesh has identified school-based barriers to menstrual management, while international evidence has similarly linked menstruation-related school difficulties with inadequate water, sanitation, disposal facilities, privacy, pain, fear of leakage, and social restrictions (Alam et al., 2017; van Eijk et al., 2016). In Bangladesh, UNICEF has also reported continuing challenges related to menstrual stigma, access to menstrual materials, and school facilities. Most participants reported having received at least some information about menstruation before menarche, although only 17.0% described

themselves as well informed. Mothers were the most frequently reported source of information (55.8%), followed by sisters and teachers. The prominent role of mothers and other female family members is consistent with the broader literature on menstrual health education. However, information from family members does not necessarily ensure that girls receive complete or accurate information. A systematic review of menstrual education interventions found that educational programmes can improve menstrual knowledge and skills, particularly when they encourage discussion and active participation (Evans et al., 2022). Similarly, a school-based intervention in Bangladesh demonstrated improvements in menstrual knowledge, beliefs, practices, and some menstruation-related outcomes following structured menstrual health education (Haque et al., 2014). These findings support the relevance of providing age-appropriate menstrual education before menarche and reinforcing it through schools and families.

Menstruation was reported to affect daily activities by 64.1% of participants, while 83.5% reported cultural or family restrictions. These findings indicate that menstrual health experiences extend beyond physiological characteristics. Pain and other symptoms may affect daily functioning, while school-based difficulties and sociocultural restrictions may further shape how girls manage menstruation. Evidence from Bangladesh has documented the relationship between menstrual hygiene management and school absence, while research in other settings has identified pain, inadequate facilities, fear of leakage, and restrictions as factors that can interfere with school participation (Alam et al., 2017; van Eijk et al., 2016). The present study did not measure school absenteeism directly; therefore, the reported effect on daily activities should not be interpreted as a measure of absenteeism or academic impact.

A particularly important finding was the difference between cycle length and the overall menstrual-pattern classification. Although 90.0% of participants reported a cycle length of 21–35 days,

only 30.1% were classified as having a regular pattern according to the study-specific composite scoring system. This finding is not necessarily contradictory because the two measures capture different aspects of menstruation. The composite classification incorporated multiple questionnaire characteristics rather than cycle length alone. Nevertheless, the scoring system was developed specifically for the present study and was not based on a validated standardized clinical instrument. The categories of regular, occasionally irregular, and irregular should therefore be regarded as descriptive classifications specific to this study rather than clinical diagnoses.

This methodological consideration is particularly important when comparing the present findings with previous studies. Published research on adolescent menstrual health has used different definitions of regularity, cycle length, symptoms, and menstrual disorders. Differences in operational definitions can substantially influence reported prevalence estimates. Future research should use validated menstrual-health measures and clearly specified clinical or epidemiological criteria for menstrual regularity and menstrual disorders. Where possible, prospective recording of menstrual cycles may also reduce recall-related measurement error.

The findings should also be interpreted in light of the study design. Participants were recruited from a single educational institution using non-probability purposive sampling; therefore, the results cannot be assumed to represent adolescent girls attending other schools in Khulna or elsewhere in Bangladesh. In addition, menstrual characteristics, hygiene practices, symptoms, and sociocultural experiences were self-reported and may have been influenced by recall or social-desirability bias. The study-specific composite scoring system is another limitation because its validity and reliability have not been established. These considerations limit direct comparison with studies using standardized instruments or probability-based sampling.

Overall, the present study indicates that adolescent girls in the study setting reported a high frequency of menstrual symptoms and substantial effects of menstruation on daily activities, despite generally favorable reported hygiene practices and widespread exposure to menstrual health education. Difficulties maintaining hygiene at school and the high frequency of cultural or family restrictions suggest that menstrual health should be addressed through a combination of individual education, supportive family communication, and school environments that provide adequate facilities and privacy. However, these implications should be interpreted as context-specific rather than generalized to all adolescent girls in Bangladesh.

5. Strengths and Limitations

The study provides institution-specific information on menstrual patterns, menstrual symptoms, menstrual hygiene practices, and sociocultural experiences among adolescent girls attending Khulna Government Model School and College. The use of a structured questionnaire, expert review, pretesting, face-to-face data collection, and systematic checking of completed questionnaires strengthened the data-collection process.

Several limitations should be considered when interpreting the findings. First, the study was conducted in a single educational institution using non-probability purposive sampling. Therefore, the participants may not be representative of adolescent girls in other schools or colleges in Khulna or elsewhere in Bangladesh, and the findings should not be generalized beyond the study population. Differences in school type, socioeconomic circumstances, residential setting, family environment, access to water and sanitation facilities, and educational resources may influence menstrual experiences and hygiene practices.

Second, although the sample size was estimated using the Taro Yamane formula with a 5% precision parameter, the use of non-probability sampling means that this parameter should not be interpreted as a statistically guaranteed margin of sampling error. Third, the relatively limited sample size may have reduced the ability to capture variation within the study population. Fourth, menstrual characteristics and experiences were

self-reported and may therefore have been affected by recall or social-desirability bias. Finally, cultural taboos, embarrassment, and privacy concerns may have influenced responses to sensitive questions.

The composite menstrual-pattern scoring system was developed specifically for this study and was not a previously validated standardized instrument. Consequently, classifications derived from this score should be interpreted as descriptive findings rather than clinical diagnoses.

6. Conclusion

The study identified substantial variation in menstrual characteristics, symptoms, hygiene practices, and sociocultural experiences among adolescent girls attending Khulna Government Model School and College. Although most participants reported a menstrual cycle length of 21–35 days and regular genital hygiene, a substantial proportion were classified as having an occasionally irregular or irregular menstrual pattern according to the study-specific composite scoring system. Menstrual symptoms and pain were commonly reported, and menstruation affected daily activities for a considerable proportion of participants. Difficulties maintaining menstrual hygiene at school and cultural or family restrictions were also frequently reported.

These findings indicate the importance of addressing menstrual health through both individual education and supportive family and school environments. Comprehensive school-based menstrual health education, adequate water and sanitation facilities, appropriate menstrual hygiene resources, and timely access to healthcare may help adolescents manage menstruation safely and confidently. Because the composite menstrual-pattern score was developed specifically for this study and was not a validated clinical instrument, the reported classifications should be interpreted as descriptive rather than clinical findings. Further research using validated menstrual-health measures and representative samples from multiple educational settings is warranted.

7. Recommendations

Based on the study findings, the following recommendations are proposed:

1. Strengthen school-based menstrual health education: Schools should provide regular, age-appropriate education covering normal menstrual patterns, menstrual hygiene, menstrual pain, and warning signs that may require medical attention.
2. Promote family support and communication: Parents and family members should be encouraged to discuss menstruation openly and provide appropriate emotional and practical support to adolescent girls.
3. Improve school menstrual hygiene facilities: Schools should ensure access to clean and private toilets, adequate water, menstrual hygiene facilities, and appropriate systems for the disposal of used menstrual materials.
4. Facilitate appropriate healthcare seeking: Girls experiencing persistent menstrual irregularities, excessive bleeding, or severe menstrual pain should be encouraged and supported to seek assessment from an appropriate healthcare professional.
5. Increase the involvement of healthcare professionals: Nurses and other qualified healthcare professionals should participate in school-based menstrual health education, counseling, and referral services.
6. Conduct larger and multisite studies: Future studies should include larger samples from multiple schools and geographical areas and, where feasible, use probability-based sampling to improve the representativeness and generalizability of findings.
7. Examine relevant associated factors: Future research should investigate associations between menstrual patterns and factors such as nutritional status, BMI, socioeconomic characteristics, and school absenteeism using appropriate inferential statistical methods.

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