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KNOWLEDGE, ATTITUDES, PRACTICES AND ASSOCIATED FACTORS REGARDING MENSTRUATION AMONG FEMALE UNDERGRADUATE MEDICAL STUDENTS AT A TERTIARY CARE TEACHING HOSPITAL, PATNA, BIHAR: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Menstruation continues to be influenced by stigma, myths and sociocultural restriction in India, which may affect knowledge, attitudes and hygiene practices. Female medical students are future healthcare providers and potential sources of reproductive-health counselling, yet medical training alone does not guarantee adequate menstrual knowledge, attitudes or practices. The objective is to assess knowledge, attitudes and practices (KAP) regarding menstruation among female undergraduate medical students at a tertiary care teaching hospital in Patna, Bihar, and to identify factors associated with each KAP domain.

Materials and Methods: An analytical cross-sectional study was conducted among 200 female undergraduate medical students (50 each from the first, second, third and final professional years), selected by simple random sampling, using a structured, self-administered, pre-tested questionnaire. Knowledge, attitude and practice scores were categorised as adequate/positive/appropriate using predefined cut-offs. Associations were assessed using the chi-square test, and independent predictors were identified using multivariable logistic regression (Jamovi version 2.6.26).

Results: Mean age was 19.8 ± 1.5 years. Adequate knowledge was present in 167 (83.5%) participants, a positive attitude in 116 (58.0%), and appropriate menstrual hygiene practice in 151 (75.5%). All three KAP domains improved significantly with advancing academic year ($p < 0.001$ for each). On multivariable analysis, each one-year increase in academic year was independently associated with higher odds of adequate knowledge (adjusted odds ratio [aOR] 3.24, 95% CI 1.98–5.30), positive attitude (aOR 2.09, 95% CI 1.53–2.87) and appropriate practice (aOR 2.20, 95% CI 1.54–3.15; all $p < 0.001$). Hostel residence was independently associated with adequate knowledge (aOR 3.86, 95% CI 1.53–9.75), and nuclear family structure with positive attitude (aOR 6.67, 95% CI 3.25–13.69; $p < 0.001$).

Conclusion: Medical students in this cohort demonstrated relatively high menstrual knowledge and appropriate hygiene practices but comparatively lower positive attitudes, indicating a knowledge–attitude gap centred on comfort discussing menstruation. Academic year, hostel residence and family structure were consistent independent determinants across KAP domains, supporting the need for structured, early, curriculum-embedded menstrual health education that addresses attitudes and stigma alongside factual knowledge.

Keywords: Menstrual hygiene; Knowledge, attitude and practice; Medical students; Cross-sectional study; Bihar, India.

INTRODUCTION

Menstruation is a normal physiological process and an essential aspect of reproductive health. However, menstrual health extends beyond hygiene alone. The World Health Organization (WHO) describes menstrual health as a state of complete physical, mental and social well-being in relation to the menstrual cycle, encompassing access to accurate information, appropriate menstrual materials and facilities, supportive environments, and timely health care for menstrual-related concerns.[1]

Despite increasing recognition of menstrual health, menstruation continues to be influenced by stigma, myths, embarrassment and sociocultural restrictions, which may affect menstrual knowledge, attitudes, hygiene practices and healthcare-seeking behaviour.[2] In India, national initiatives such as the Menstrual Hygiene Scheme aim to improve awareness, access to menstrual absorbents and safe disposal practices.[3] The National Menstrual Hygiene Policy further emphasises menstrual education, affordable products, adequate sanitation, safe disposal, and reduction of stigma and misinformation.[4]

The National Family Health Survey-5 (NFHS-5) reported hygienic menstrual protection use among approximately 78% of women aged 15–24 years nationally, compared with about 73% in rural and 90% in urban areas. Bihar reported a considerably lower prevalence of approximately 59%, highlighting the continuing need for menstrual-health interventions in the state.[5]

Menstrual knowledge, attitudes and practices (KAP) are interconnected components of menstrual health. Research among college and university students has demonstrated variation in menstrual knowledge and attitudes, with sociocultural beliefs continuing to influence perceptions despite formal education.[6,7]

Female undergraduate medical students are an important group for studying menstrual KAP because they are future healthcare professionals and potential sources of reproductive-health information. However, medical education alone may not ensure adequate knowledge or positive attitudes and practices regarding menstruation. Identifying such gaps may therefore benefit both students' own well-being and their future counselling practices.

MATERIALS AND METHODS

Study design and setting: An analytical cross-sectional study was conducted at Patna Medical College and Hospital (PMCH), Patna, Bihar.

Study duration: The study was conducted from November 2024 to March 2025.

Study population and eligibility criteria: The study population comprised female undergraduate medical students of PMCH, drawn from the 1st, 2nd, 3rd and final (4th) professional year batches.

Inclusion criteria

Female medical undergraduate students of PMCH who had attained menarche and gave informed consent to participate were included.

Exclusion criteria

Students on medication known to alter the menstrual cycle, and those who did not give informed consent or submitted incompletely filled questionnaires, were excluded.

Sample size: In the absence of a Bihar-specific prevalence estimate for menstrual knowledge, attitude or practice among medical students, the sample size was calculated using the prevalence of hygienic menstrual protection use among women aged 15–24 years in Bihar (59%), as reported in NFHS-5 (2019–21).[5] The minimum required sample size was calculated using the formula $n = Z^2pq/d^2$, where $Z = 1.96$ (95% confidence level), p = expected prevalence (0.59), $q = (1 - p) = 0.41$, and d = absolute precision of 7%. This yielded a minimum required sample size of 190, rounded up to 200 participants, with 50 female students recruited from each of the four undergraduate batches.

Sampling technique: Participants were selected using simple random sampling. The sampling frame for each academic batch comprised the attendance register maintained by the Department of Community Medicine. From each of the four batches, 50 female students were selected by simple random sampling from the respective attendance register, yielding a total sample of 200 participants.

Data collection tool: Data were collected using a structured, self-administered, pre-tested questionnaire adapted from a previous study.[11] The questionnaire included sections on socio-demographic characteristics, menstrual knowledge, attitudes towards menstruation, and menstrual hygiene practices.

Operational definitions and scoring: Knowledge was assessed using five objective questions. Each correct response was assigned a score of 1, while incorrect or "don't know" responses were scored as 0, giving a total knowledge score ranging from 0 to 5. A total knowledge score ≥ 3 was regarded as adequate knowledge.

Attitude was assessed using three items rated on a five-point Likert scale, with scores ranging from 0 to 4 for each item, yielding a total attitude score of 0 to 12. A total attitude score ≥ 8 was regarded as a positive attitude.

Menstrual hygiene practices were assessed using four items, each scored from 0 to 2, giving a total practice score ranging from 0 to 8. A total practice score ≥ 5 was regarded as appropriate menstrual hygiene practice.

Higher scores indicated better knowledge, more positive attitudes and healthier menstrual hygiene practices. Information on medication use during menstruation was collected but not included in the practice score, as it represented symptom

management rather than a menstrual hygiene practice.

Comorbidity status: Polycystic ovary syndrome (PCOS) was chosen as the sole comorbidity of interest given its high prevalence among reproductive-aged women and its well-established association with menstrual cycle irregularity and hygiene-related behaviour.9 Comorbidity status was self-reported: participants were asked whether they had been diagnosed with PCOS by a physician, and this variable was coded as a binary covariate for inclusion in the regression models.

Statistical analysis: Data were entered into Microsoft Excel 2013 and analysed using Jamovi version 2.6.26.10 Categorical variables were summarised as frequencies and percentages, and continuous variables as mean ± standard deviation (SD). Associations between categorical variables were assessed using the chi-square test. Multiple logistic regression analysis was performed to identify independent factors associated with knowledge, attitude and practice. Variables with $p \leq 0.20$ on bivariate analysis were considered for multivariable modelling. Age was not entered simultaneously with academic year because of substantial collinearity between the two variables. All statistical tests were two-tailed, and $p < 0.05$ was considered statistically significant.

RESULTS

Participant characteristics: A total of 200 female undergraduate medical students were included in the analysis, with an equal number of participants from each year of study (50 students from each of the first, second, third and fourth years). The mean age of the participants was 19.8 ± 1.5 years, with ages ranging from 18 to 25 years.

Of the 200 participants, 105 (52.5%) resided in the college hostel, while 95 (47.5%) lived in rented or own accommodation. The majority belonged to nuclear families (135, 67.5%). Most participants were Hindu (153, 76.5%), followed by Muslim (42, 21.0%).

According to the BG Prasad socioeconomic classification,8 15 (7.5%) participants belonged to Class I (upper), 32 (16.0%) to Class II (upper middle), 62 (31.0%) to Class III (lower middle), 64 (32.0%) to Class IV (upper lower), and 27 (13.5%) to Class V (lower). PCOS/comorbidity was reported by 41 (20.5%) participants [Table 1].

Table 1: Socio-demographic characteristics of study participants (N = 200)

Characteristic	n (%)
Age, years	
Mean ± SD	19.8 ± 1.5
Range	18–25
Year of study	
First year	50 (25.0)
Second year	50 (25.0)
Third year	50 (25.0)
Fourth year	50 (25.0)
Residence	
College hostel	105 (52.5)
Rented/own house	95 (47.5)
Type of family	
Nuclear	135 (67.5)
Joint	65 (32.5)
Religion	
Hindu	153 (76.5)
Muslim	42 (21.0)
Others (Christian , Sikh)	5 (2.5)
BG Prasad socioeconomic class	
Class I - Upper	15 (7.5)
Class II - Upper middle	32 (16.0)
Class III - Lower middle	62 (31.0)
Class IV - Upper lower	64 (32.0)
Class V - Lower	27 (13.5)
PCOS/comorbidity	
Yes	41 (20.5)
No	159 (79.5)

Knowledge regarding menstruation

The mean knowledge score was 3.67 ± 1.19 out of 5. Overall, 167 (83.5%) participants had adequate knowledge, while 33 (16.5%) had inadequate knowledge.

At the individual-item level, 165 (82.5%) participants correctly recognised menstruation as a normal physiological process. Correct knowledge regarding the normal menstrual cycle length was observed in 144 (72.0%), while 159 (79.5%) correctly identified the normal duration of menstrual bleeding. Knowledge regarding safety of sanitary pads were present in 144 (72.0%), whereas only 121 (60.5%) correctly identified the recommended frequency of changing sanitary pads [Table 2].

The overall distribution of knowledge, attitude and practice scores is summarised in [Table 3]. Adequate knowledge increased progressively across the

academic years, from 58.0% in first-year students to 96.0% in fourth-year students ($\chi^2 = 33.50$, $p < 0.001$) [Table 4]. Adequate knowledge was also more common among hostel residents than those living in rented/own accommodation (89.5% vs 76.8%; $p = 0.026$). A statistically significant association was observed between PCOS/comorbidity and menstrual knowledge.

Table 2: Individual item level knowledge, attitude and practice responses

Domain/item	Positive/correct response, n (%)
Knowledge	
Menstruation recognized as a normal physiological process	165 (82.5)
Correct knowledge of 21–35-day menstrual cycle	144 (72.0)
Correct knowledge of 2–7-day bleeding duration	159 (79.5)
Correct knowledge regarding safety of sanitary pads	144 (72.0)
Correct knowledge regarding changing sanitary pads every 2–4 h	121 (60.5)
Attitude	
Considered menstruation natural/normal	141 (70.5)
Comfortable discussing menstruation	94 (47.0)
Agreed that menstrual hygiene has health benefits	127 (63.5)
Practice	
Appropriate menstrual-product use	136 (68.0)
Appropriate frequency of changing menstrual products	110 (55.0)
Appropriate hand-washing practices before & after changing menstrual products	127 (63.5)
Appropriate disposal practices of menstrual products	127 (63.5)

Table 3: Overall distribution of knowledge, attitude, and practice scores (N = 200)

Domain (max score)	Mean ± SD	Category	n (%)
Knowledge (5)	3.67 ± 1.19	Adequate (≥3)	167 (83.5)
		Inadequate (<3)	33 (16.5)
Attitude (12)	8.07 ± 3.12	Positive (≥8)	116 (58.0)
		Negative (<8)	84 (42.0)
Practice (8)	6.04 ± 2.35	Appropriate (≥5)	151 (75.5)
		Inappropriate (<5)	49 (24.5)

Table 4: Distribution of adequate knowledge, positive attitude and appropriate practice by year of study (N = 200)

Year of study	Adequate knowledge, n (%)	Positive attitude, n (%)	Appropriate practice, n (%)
First year (n=50)	29 (58.0)	16 (32.0)	32 (64.0)
Second year (n=50)	43 (86.0)	29 (58.0)	30 (60.0)
Third year (n=50)	47 (94.0)	32 (64.0)	42 (84.0)
Fourth year (n=50)	48 (96.0)	39 (78.0)	47 (94.0)
χ^2 statistic	33.50	22.82	21.27
p-value	<0.001	<0.001	<0.001

Note: χ^2 test for association. Knowledge was categorized as adequate at ≥3 of the maximum score; attitude was categorized as positive at ≥8; practice was categorized as appropriate at ≥5.

Attitudes towards menstruation

The mean attitude score was 8.07 ± 3.12 out of 12. Overall, 116 (58.0%) participants demonstrated a positive attitude, whereas 84 (42.0%) demonstrated a negative attitude.

The proportion of students with a positive attitude increased significantly with advancing year of study, from 32.0% in first year to 78.0% in fourth year ($\chi^2 = 22.82$, $p < 0.001$) [Table 4].

A particularly important finding was that although 70.5% of students considered menstruation a natural process, only 47.0% reported being comfortable discussing menstruation, suggesting persistence of social discomfort surrounding menstrual communication [Table 2].

A strong association was observed between type of family and attitude. Positive attitudes were reported by 71.1% of students from nuclear families compared with 30.8% of those from joint families ($\chi^2 = 27.68$, $p < 0.001$). No significant association was observed between attitude and residence, religion, socioeconomic status or PCOS/comorbidity (all $p > 0.05$).

Menstrual hygiene practices

The mean practice score was 6.04 ± 2.35 out of 8. Overall, 151 (75.5%) participants had appropriate menstrual hygiene practices, whereas 49 (24.5%) had inappropriate practices [Table 2 and 3].

Appropriate practices varied significantly by year of study, increasing from 64.0% in first-year students to 94.0% in fourth-year students ($\chi^2 = 21.27$, $p < 0.001$) [Table 4].

Appropriate practices were observed in 80.0% of hostel residents compared with 70.5% of students living in rented/own accommodation; this difference was not statistically significant ($p = 0.164$).

A statistically significant association was observed between PCOS/comorbidity and menstrual hygiene practices. Appropriate practices were reported by 97.6% of participants with PCOS/comorbidity compared with 69.8% of those without PCOS/comorbidity ($\chi^2 = 12.11$, $p < 0.001$).

Factors associated with knowledge, attitude and practices.

Table 5: Bivariate association between participant characteristics and knowledge, attitude and practice categories (χ^2 test)

Predictor	Knowledge, p	Attitude, p	Practice, p
Year of study	<0.001*	<0.001*	<0.001*
Residence	0.026*	0.491	0.164
Religion	0.370	0.978	0.571
Type of family	0.470	<0.001*	0.580
BG Prasad socioeconomic class	0.068	0.966	0.984
PCOS/comorbidity	0.025*	0.129	<0.001*

*p < 0.05- Statistically Significant

On bivariate analysis, year of study was significantly associated with all three KAP domains. Residence was significantly associated with knowledge (p = 0.026), but not with attitude or practice. Type of family was strongly associated with attitude (p < 0.001), but not with knowledge or practice.

Socioeconomic status showed a borderline association with knowledge (p = 0.068) and no significant association with attitude or practice. PCOS/comorbidity was significantly associated with knowledge (p = 0.025) and practice (p < 0.001), but not with attitude (p = 0.129). Religion was not significantly associated with any of the three KAP outcomes [Table 5].

Independent predictors of knowledge, attitude and practice.

Table 6: Multivariable logistic regression analysis of factors independently associated with adequate knowledge, positive attitude and appropriate practice

Predictor	Adequate knowledge aOR (95% CI), p	Positive attitude aOR (95% CI), p	Appropriate practice aOR (95% CI), p
Year of study (per year)	3.24 (1.98–5.30), <0.001*	2.09 (1.53–2.87), <0.001*	2.20 (1.54–3.15), <0.001*
Hostel residence (vs rented/own)#	3.86 (1.53–9.75), 0.004*	—	1.98 (0.95–4.10), 0.067
Nuclear family (vs joint)#	—	6.67 (3.25–13.69), <0.001*	—
Higher BG Prasad SES class (per class)	1.54 (1.02–2.32), 0.040*	—	—
PCOS/comorbidity (vs no)#	0.26 (0.10–0.71), 0.009*	0.56 (0.25–1.28), 0.169	22.94 (2.96–178.00), 0.003*

*p<0.05 Statistically Significant; OR: adjusted odds ratio; CI: confidence interval; SES: socioeconomic status; # Reference categories. Year of study was entered as an ordinal variable (1–4).

Separate multivariable logistic regression models were constructed for adequate knowledge, positive attitude and appropriate menstrual hygiene practice. Year of study was treated as an ordinal variable. Age was not entered simultaneously into the models because of its strong correlation with year of study, which raised concern regarding multicollinearity.

For adequate knowledge, each one-year increase in academic year was associated with approximately 3.24-fold higher odds of adequate knowledge (aOR 3.24, 95% CI 1.98–5.30; p < 0.001). Hostel residence was independently associated with higher odds of adequate knowledge (aOR 3.86, 95% CI 1.53–9.75; p = 0.004). Higher socioeconomic class was also associated with higher odds of adequate knowledge (aOR 1.54, 95% CI 1.02–2.32; p = 0.040).

For positive attitude, each increase in year of study was associated with higher odds of a positive attitude (aOR 2.09, 95% CI 1.53–2.87; p < 0.001). Students from nuclear families had substantially higher odds of a positive attitude compared with those from joint families (aOR 6.67, 95% CI 3.25–13.69; p < 0.001).

For appropriate menstrual hygiene practice, each increase in year of study was independently associated with higher odds of appropriate practice (aOR 2.20, 95% CI 1.54–3.15; p < 0.001). PCOS/comorbidity was also associated with substantially higher odds of appropriate practice (aOR 22.94, 95% CI 2.96–178.00; p = 0.003), although the wide confidence interval indicates considerable imprecision, reflecting the small number of participants with PCOS/comorbidity [Table 6].

Overall KAP findings [Table 3]

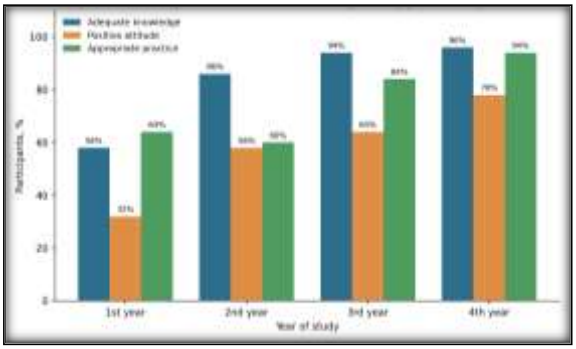

Figure 1: Trends in adequate knowledge, positive attitude and appropriate practice across academic year (N = 200).



Figure 2: Overall distribution of knowledge, attitude and practice categories (N = 200).

Advancing academic year was consistently associated with better knowledge, more positive attitudes and more appropriate practices [Figure 1]. Overall, the study demonstrated a high prevalence of adequate menstrual knowledge (83.5%) and appropriate menstrual hygiene practices (75.5%),

whereas the proportion demonstrating a positive attitude was lower (58.0%) [Figure 2]. Family structure emerged as an important determinant of attitude, with students from nuclear families showing substantially higher odds of positive attitudes. Hostel residence was independently associated with knowledge, while socioeconomic status showed a modest association with knowledge.

The relatively lower proportion of students who were comfortable discussing menstruation (47.0%) despite generally good factual knowledge highlights a gap between knowledge and social/attitudinal acceptance.

DISCUSSION

The present study assessed menstrual knowledge, attitudes and hygiene practices among 200 female undergraduate medical students at a tertiary care teaching hospital in Patna, Bihar. Overall, the participants demonstrated relatively high levels of menstrual knowledge and appropriate menstrual hygiene practices, while positive attitudes were comparatively less common. Adequate knowledge was observed in 83.5% of participants, appropriate menstrual hygiene practice in 75.5%, and a positive attitude in 58.0%. Academic year emerged as the most consistent factor associated with all three domains, whereas hostel residence and nuclear family structure were independently associated with knowledge and attitude, respectively. These findings suggest that although medical education may be associated with better menstrual-health knowledge and practices, attitudinal barriers and discomfort surrounding menstrual communication may persist even among future healthcare professionals.

Knowledge regarding menstruation

In the present study, 83.5% of participants had adequate menstrual knowledge, with a mean knowledge score of 3.67 ± 1.19 out of 5. Knowledge was relatively high for recognising menstruation as a normal physiological process and identifying the usual duration of menstrual bleeding. However, important gaps remained in practical aspects of menstrual hygiene: only 60.5% correctly identified the recommended frequency of changing menstrual products. This finding indicates that good general awareness does not necessarily translate into complete knowledge of practical menstrual-health management.

The high level of knowledge observed in the present study is understandable given the educational background of the participants. Medical students receive formal teaching in anatomy, physiology, obstetrics and gynaecology, reproductive health and community medicine, which may provide repeated exposure to menstrual-health concepts. A 2024 cross-sectional study among 290 female medical undergraduate students in Karnataka similarly reported substantial awareness of menstrual health, although gaps persisted in menstrual experiences and hygiene practices.[13] More recently, Jahan et al., in a 2026 study among female medical students in Bangladesh, reported that all participants were aware of menstruation and 89.1% correctly identified the normal menstrual-cycle length; however, only 56.5% correctly identified the appropriate frequency of changing menstrual products.[11] The latter finding is particularly comparable with the present study, in which 60.5% correctly identified the recommended changing frequency.

The progressive increase in adequate knowledge across academic years in the present study is noteworthy. Adequate knowledge increased from 58.0% among first-year students to 96.0% among fourth-year students, and each one-year increase in academic year was independently associated with higher odds of adequate knowledge (aOR 3.24, 95% CI 1.98–5.30). This may reflect cumulative exposure to biomedical and reproductive-health education during medical training. However, because of the cross-sectional design, this association should not be interpreted as definitive evidence that progression through medical school itself caused the improvement.

Evidence from younger populations also demonstrates substantial gaps in menstrual knowledge despite increasing educational exposure. Rajput et al., in a 2025 cross-sectional study among 1,160 high-school girls in urban central India, found that only 52.5% had good menstrual knowledge, with age, grade, maternal education and family income being important determinants.[12] The higher level of knowledge in the present study may therefore reflect the considerably greater educational attainment and biomedical exposure of medical students.

Knowledge–attitude gap and menstrual stigma

An important finding of the present study was the discrepancy between factual knowledge and attitudinal acceptance. Although 82.5% of participants recognised menstruation as a normal physiological process, only 47.0% reported being comfortable discussing menstruation. Consequently, while 83.5% met the predefined criterion for adequate knowledge, only 58.0% demonstrated a positive overall attitude.

This knowledge–attitude gap is consistent with the broader understanding of menstrual health as a multidimensional issue extending beyond hygiene and factual awareness. The World Health Organization conceptualises menstrual health as encompassing physical, mental and social well-being in relation to the menstrual cycle, including access to information, appropriate materials, supportive environments and the ability to participate fully in society without stigma.[1]

Evidence from South Asian populations similarly indicates that menstrual stigma and social restrictions may persist despite adequate awareness. In a cross-sectional study among college and university students in Haryana, Kumar et al. documented continuing menstrual taboos and socially influenced attitudes among educated young women.[6] A

systematic review and qualitative metasynthesis by Hennegan et al., involving more than 6,000 participants from 35 low- and middle-income countries, identified stigma, shame, restricted social support, limited knowledge and socially imposed expectations as important components of menstrual experience.[2] These findings support the interpretation that menstrual stigma may not be adequately addressed through information provision alone.

The recent study among female medical students in Bangladesh also demonstrated a similar pattern of good general awareness but persisting practical gaps.[11] Thus, the relatively low proportion of participants comfortable discussing menstruation in the present study may reflect persistent sociocultural norms rather than a simple deficiency in biomedical knowledge.

Academic year and menstrual KAP

Academic year was the strongest and most consistent determinant of the three KAP domains in the present study. Adequate knowledge increased from 58.0% in first-year students to 96.0% in fourth-year students; positive attitude increased from 32.0% to 78.0%; and appropriate practice increased from 64.0% to 94.0%. These associations remained statistically significant after adjustment, with each increase in academic year associated with higher odds of adequate knowledge (aOR 3.24), positive attitude (aOR 2.09) and appropriate practice (aOR 2.20).

The consistent academic-year gradient is educationally plausible. Progressive exposure to reproductive physiology, menstrual disorders, reproductive health and community medicine may improve students' knowledge and confidence in dealing with menstrual-health issues. The improvement in practice may additionally reflect greater maturity, autonomy and access to health information.

However, the cross-sectional nature of the study requires caution in interpreting this gradient. Differences between academic batches may also arise from differences in prior educational exposure, family background, socioeconomic circumstances or access to information. A longitudinal cohort following students from the first to the final professional year would be better suited to establish whether the observed improvement is attributable to medical education.

Nevertheless, the findings have practical implications. The relatively lower KAP levels among first-year students suggest that menstrual-health education should be introduced early in the undergraduate medical curriculum rather than relying on knowledge and confidence to develop gradually through informal exposure.

Family structure and attitude

Type of family was strongly associated with menstrual attitude. Positive attitudes were reported by 71.1% of students from nuclear families compared with 30.8% of those from joint families, and nuclear family structure remained independently associated with positive attitude in multivariable analysis (aOR 6.67, 95% CI 3.25–13.69).

One possible explanation is that family structure may influence communication patterns and exposure to sociocultural beliefs regarding menstruation. Smaller family units may facilitate more direct communication between parents and daughters regarding reproductive health, whereas multigenerational households may expose young women to a greater diversity of traditional beliefs and restrictions. However, the present study did not directly assess family communication, menstrual restrictions or sources of information. Therefore, the mechanism underlying this association cannot be established.

This finding is particularly relevant in the context of the observed low comfort in discussing menstruation. Hennegan et al. reported that menstrual experiences are strongly shaped by social norms, stigma, confidence and interpersonal support.[2] Therefore, interventions aimed at improving menstrual attitudes should provide opportunities for open communication and discussion rather than focusing exclusively on biomedical information.

Hostel residence and menstrual knowledge

Hostel residence was independently associated with adequate knowledge. Hostel residents had higher odds of adequate knowledge than students living in rented or own accommodation (aOR 3.86, 95% CI 1.53–9.75). This association may plausibly reflect increased peer interaction, informal exchange of health information and greater autonomy in seeking information about reproductive health.

A similar association has been reported among female medical students in Bangladesh, where hostel residence was significantly associated with higher KAP scores.[11] However, that study also involved a small, single-institution sample, and the authors appropriately advised caution in interpreting the association. Therefore, hostel residence should not be considered a causal determinant of menstrual knowledge on the basis of the present findings.

Interestingly, hostel residence was not independently associated with appropriate menstrual hygiene practice after adjustment. This suggests that the relationship may be more closely related to information exposure than to behaviour itself.

Menstrual hygiene practices

Three-quarters of the participants (75.5%) demonstrated appropriate menstrual hygiene practices. This relatively favourable level is plausible given the educational and socioeconomic characteristics of the study population and their access to menstrual products and sanitation facilities. In contrast, a 2025 study among 1,160 high-school girls in urban central India reported good menstrual hygiene practices in only 42.1% of participants.[12] The difference may partly reflect the considerably higher educational level of medical students, as well as differences in age, socioeconomic circumstances and access to information and facilities.

The recent Bangladesh study among female medical students also identified practical gaps despite high general awareness. Only 56.5% of participants correctly identified changing menstrual products every two to four hours as appropriate.[11] Similarly, in the present study, only 55.0% reported an appropriate frequency of changing menstrual products. This consistency across two medical-student populations from South Asia suggests that practical menstrual-hygiene behaviours may remain an important area for targeted education even when general knowledge is good.

Other components of practice also demonstrated room for improvement. Appropriate handwashing before and after changing menstrual products and appropriate disposal practices were each reported by 63.5% of participants. Thus, the overall classification of 75.5% appropriate practice should not obscure specific behavioural gaps that may benefit from focused interventions.

PCOS/comorbidity and menstrual hygiene practice: A strong association was observed between self-reported PCOS/comorbidity and appropriate menstrual hygiene practice. Participants reporting PCOS/comorbidity had substantially higher odds of appropriate practice (aOR 22.94, 95% CI 2.96–178.00). However, this result requires cautious interpretation.

Only 41 participants reported PCOS/comorbidity, and 97.6% of these participants were classified as having appropriate menstrual hygiene practices. The very wide confidence interval indicates substantial statistical imprecision. Furthermore, the cross-sectional design prevents assessment of temporality or causality. It would therefore be inappropriate to conclude that PCOS itself leads to better menstrual hygiene practices.

A possible explanation is that students with diagnosed menstrual disorders may have greater contact with healthcare services and consequently greater exposure to menstrual-health information. However, healthcare utilisation and counselling exposure were not measured in the present study. The observed association should therefore be considered exploratory and hypothesis-generating.

Similarly, the inverse association between PCOS/comorbidity and adequate knowledge should be interpreted cautiously because of the relatively small subgroup and the possibility of chance or residual confounding. Larger studies specifically designed to examine menstrual disorders and KAP are needed before drawing firm conclusions.

Socioeconomic status: Socioeconomic status demonstrated a borderline association with knowledge in bivariate analysis and became statistically significant in multivariable analysis, with higher socioeconomic class associated with higher odds of adequate knowledge (aOR 1.54, 95% CI 1.02–2.32). However, socioeconomic status was not independently associated with attitude or practice.

The association with knowledge may reflect differential access to educational resources, health information and communication opportunities. Similar socioeconomic influences have been identified in adolescent populations. Rajput et al. reported family income and maternal education among factors associated with menstrual knowledge and hygiene practices in high-school girls in central India.[12]

The absence of a significant independent association between socioeconomic status and practice in the present study may indicate that, within a relatively educated population with generally good access to menstrual products and sanitation, behavioural and social factors may become more important determinants of menstrual-health practices.

Implications for medical education: The findings have important implications because female medical students represent both recipients of menstrual-health information and future healthcare professionals. Adequate personal knowledge is important, but confidence in discussing menstruation is equally relevant to future reproductive-health counselling.

The observed difference between adequate knowledge and positive attitude suggests that menstrual-health education should extend beyond factual teaching. Curriculum-based interventions should address menstrual physiology and hygiene while also incorporating communication skills, stigma reduction, cultural sensitivity, myths and misconceptions, and counselling skills.

Structured small-group discussions, peer-led educational activities and supportive institutional platforms may provide opportunities for students to discuss menstruation in a non-judgemental environment. Such interventions may be particularly relevant during the early years of medical training, when the present study identified the greatest gaps.

This approach is consistent with the broader evidence that menstrual health is influenced by social norms, stigma, access to information and supportive environments in addition to availability of menstrual materials.[1,2]

Strengths and limitations: This study used a structured, pre-tested questionnaire, simple random sampling within a defined sampling frame, and multivariable analysis to identify independent predictors while adjusting for potential confounders. However, several limitations should be considered. First, the cross-sectional design precludes causal inference; the observed associations, including academic-year gradients, reflect correlation rather than a demonstrated causal pathway. Second, all information, including PCOS/comorbidity status and menstrual practices, was self-reported and subject to recall and social-desirability bias, particularly for a topic surrounded by stigma. Third, the study was conducted at a single tertiary care teaching institution, which may limit generalisability to medical students in other institutional or regional settings. Fourth, the PCOS/comorbidity subgroup was relatively small (n = 41), and the correspondingly wide confidence intervals around its associations with knowledge and practice indicate limited

precision; these estimates should be replicated in larger samples before being used to guide clinical or policy recommendations.

CONCLUSION

Female undergraduate medical students in this cohort demonstrated relatively high levels of menstrual knowledge and appropriate menstrual hygiene practices, whereas favourable attitudes, particularly comfort discussing menstruation, were less consistently observed. Academic year was the most consistent independent determinant across all three KAP domains, with higher academic level associated with greater odds of adequate knowledge, positive attitudes and appropriate practices. Hostel residence and nuclear family structure were additionally associated with knowledge and attitude, respectively. The observed knowledge–attitude gap suggests that improving menstrual health among medical students requires interventions that extend beyond information provision to actively address attitudes, communication, social norms and behavioural reinforcement — ideally introduced early in the medical curriculum rather than allowed to accrue informally with seniority. As future healthcare providers and counsellors, ensuring that medical students themselves are comfortable and well-informed about menstrual health may have downstream benefits for the quality of reproductive-health counselling they provide to their patients.

Recommendations

- Introduce structured menstrual health education early in the undergraduate medical curriculum, rather than relying on informal accrual of knowledge across professional years.
- Create supportive peer and institutional platforms (for example, hostel-based sessions and small-group discussions) to normalise open conversation about menstruation and reduce stigma-related discomfort.
- Extend menstrual health literacy and communication-skills training so that medical students, as future clinicians, are equipped to counsel patients confidently and empathetically.
- Replicate this assessment in larger, multi-institutional samples to confirm the associations observed here, particularly for the PCOS/comorbidity subgroup, before translating them into policy or curricular recommendations.

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